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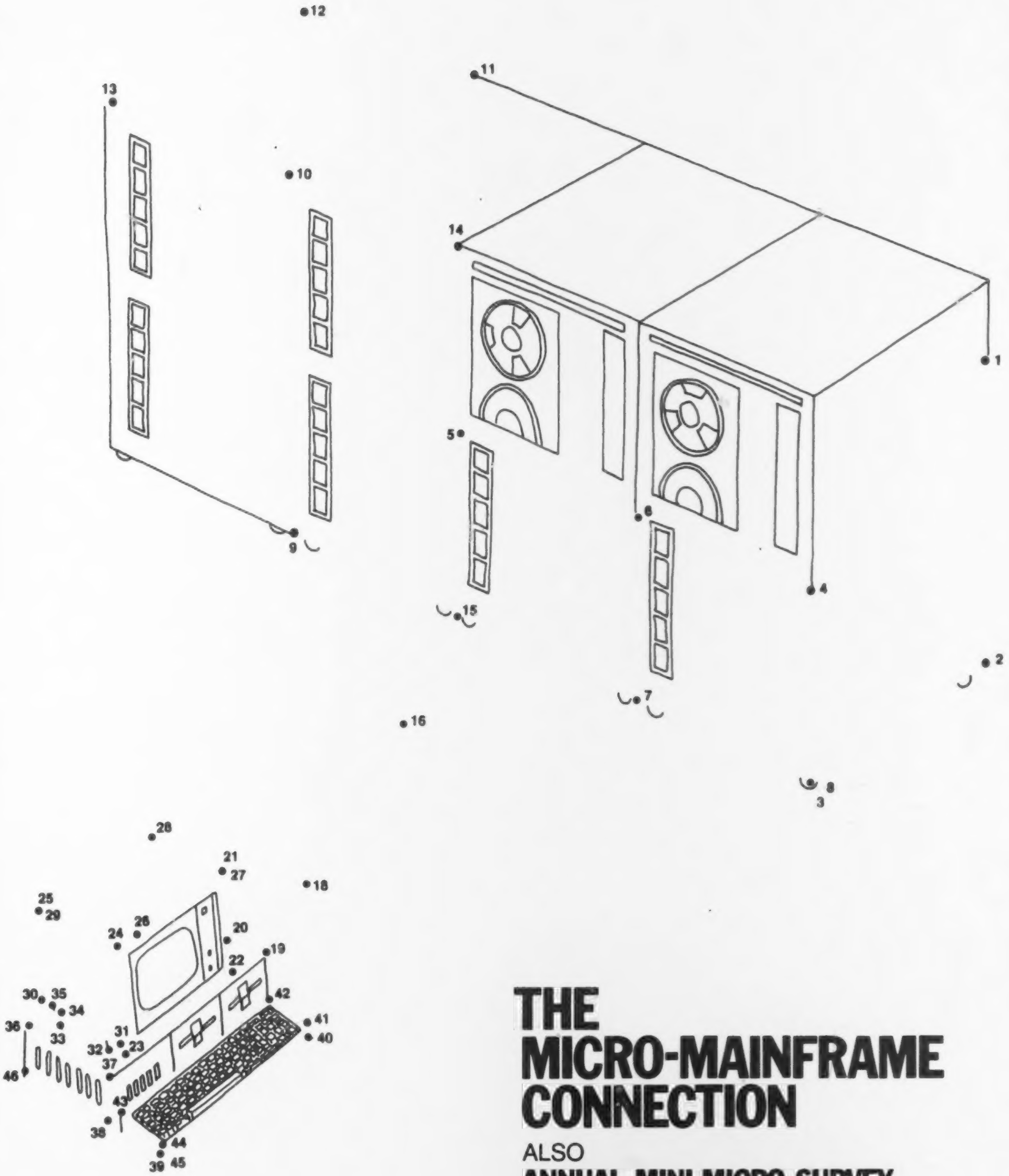
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THE MICRO-MAINFRAME CONNECTION

ALSO

ANNUAL MINI-MICRO SURVEY
HOW HIGH CAN PORTABLES FLY?
EXPERT SYSTEMS IN BUSINESS
THE PROMISE OF PROTOTYPING

DATAMATION®

NOVEMBER 1983/$4.00 U.S.A.
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COVER DRAWING BY SUSAN HUNT YULE

IN FOCUS

MINIS LOSE OUT TO PCS

The personal computer is coming on strong, taking away market growth from the traditional minicomputer.

by John W. Verity

As the trend toward centralized purchasing of personal computers strengthens, IBM is capturing more than half of all users entering the corporate personal computer marketplace, according to a major survey of DATAMATION readers.

The personal computer has brought about profound changes in the small-systems marketplace, causing users to alter their spending plans and prompting new strategies in distributed processing and other techniques. Sales of traditional 16-bit minicomputers have been most affected and vendors have had to rely on the hotly contested 32-bit market for most of their near-term growth, according to the survey.

Taken in conjunction with Cowen & Co., a Boston investment research company, the 1983-84 Mini/Microcomputer Survey tallies the responses from 7,012 users of small systems, detailing their purchases prior to August 16 and the purchases they planned to make in the following 18 months.

After eliminating duplicated and invalid responses, a total of 7,012 responses were tabulated and evaluated. For the survey's purpose, the term "minicomputer" encompasses cpus ranging from the Digital Equipment PDP-8 and Data General Nova 4 through the DEC VAX-11/780 and IBM System/36. It should be noted that this survey does not take into account IBM's introduction of aggressively priced 4300 models in September.

FIG. 1

TOP 10 MINICOMPUTER SYSTEMS 1983/84

A. Based on number of respondents acquiring systems (7/83-12/84)

MANUFACTURER	SYSTEM	HOW MANY SITES ACQUIRING	AVG. UNITS/ SITE
DEC	VAX-11/780	247	1.7
IBM	System/36	195	2.1
DEC	VAX-11/750	195	1.5
DEC	VAX-Unspecified	81	3.6
IBM	Series/1	80	12.0
HP	3000-Unspecified	73	2.6
IBM	System/38	70	1.5
DEC	PDP-11/44	69	2.5
DEC	PDP-11/23	66	5.2
DEC	VAX-11/730	64	1.9

B. Based on number of units being acquired (7/83-12/84)

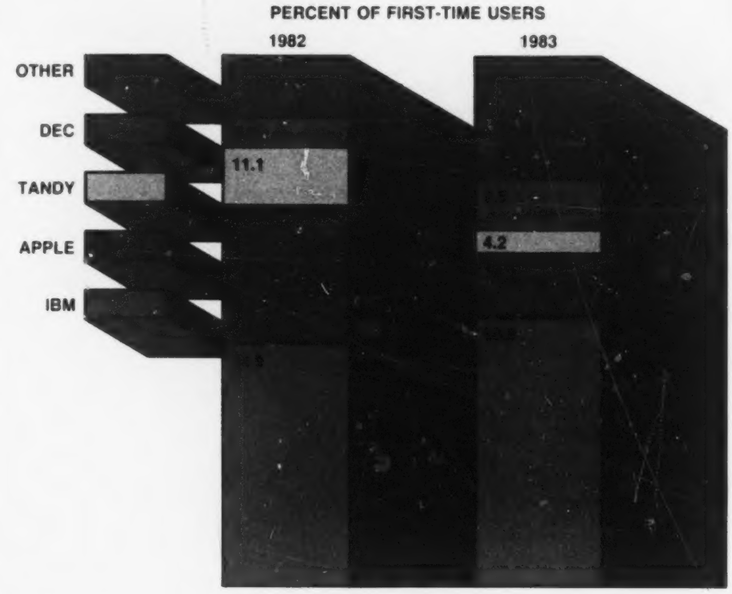
MANUFACTURER	SYSTEM	HOW MANY UNITS BEING ACQUIRED	EST. VALUE ($ MILLIONS)
IBM	Series/1	961	41.2
Microdata	Reality 4000	540	13.5
DEC	VAX-11/780	426	132.2
IBM	System/36	417	31.7
DEC	PDP-11/23	345	8.0
DEC	VAX-11/750	296	43.4
DEC	VAX-Unspecified	294	53.6
DEC	PDP-11 Unspecified	272	28.6
HP	3000 Other/Unspecified	193	28.9
Microdata	Reality 2000	180	7.2

The respondents also plan to acquire:
- 173 PDP-11/44's for $9.1 million
- 48 DG MV/10000's for $14.0 million and 60 MV/4000's for $7.4 million
- 146 IBM 8100's for $20.4 million and 108 System/38's for $26.7 million
- 167 Burroughs B20's for $2.3 million
- 83 Prime 2250's for $6.3 million and 7 9950's for $2.9 million
- 33 Western Electric 3B20S's for $7.4 million and 21 3B5's for $1.4 million

In total, 2,629 respondents reported plans to acquire 13,325 systems valued at roughly $1.2 billion between 7/83 and 7/84.

FIG. 2

IBM NOW CAPTURING OVER HALF OF ALL NEW CORPORATE PC USERS

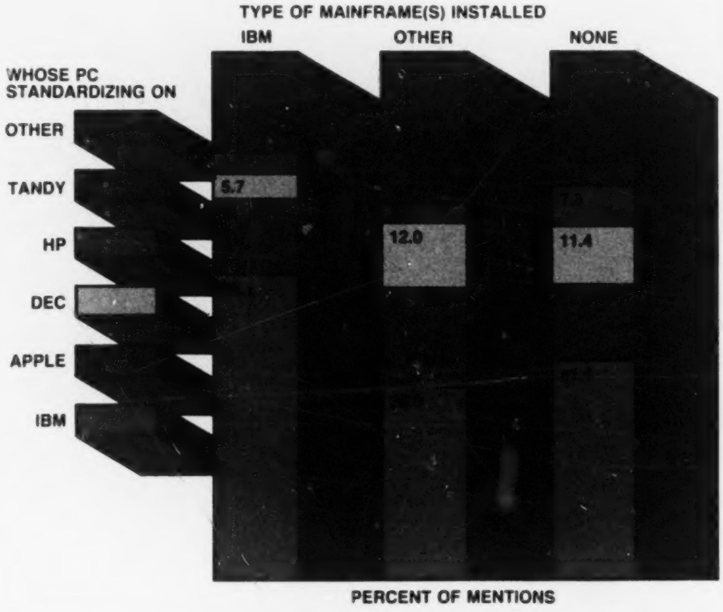


Rapid growth in this percentage indicated for DEC also, and for "Other" supplier category

FIG. 3

IBM MAINFRAME STRENGTH AIDS PC GROWTH

Query: If your organization has standardized (or is likely to soon) on just one or two personal computers, whose?



CHARTS BY PAUL GOODFRIEND

Particular attention was given in this year's survey to the personal computer, leading to the following observations:

- Pioneers in the market, such as Apple Computer and Tandy, have lost and will continue to lose market share to IBM.
- Software availability is far and away the most important criterion for selection of personal computers by corporate users.
- A handful of software packages offering a rather narrow range of functions accounts for 70% of personal computer applications.
- Among end users surveyed, as opposed to oems and systems houses, more sites will buy personal computers than minicomputers.

This year's survey indicates that the peak rate of new personal computer user growth has passed. Last year, the first full year of IBM P.C. shipments, saw a 130.4% yearly growth rate in the personal computer user base, compared to this year's rate of 86.1%.

This, however, is only one sign of IBM's dominance in the corporate purchasing of personal machines. The compound growth rate of installed user population for Apple and Tandy sites dropped dramatically in this year's figures. While last year its survey base grew 69% compounded over three years, Apple's rate this year was only 30%. Similarly, last year Tandy showed a rate of 64%, which plummeted to 27% this year.

Indeed, the survey indicates that IBM is currently capturing over half (50.9%) of all new users entering the corporate personal computer marketplace. This compares with Apple's figure of 12%, Tandy's 4.2%, and DEC's 9.5%. For DEC, the question arises as to how many of its personal computer installations are new sites and how many are replacements for installed minicomputers.

IBM's dominance of the personal computer industry is clear in virtually every measurement.

Banking, insurance, and education SIC sites showed particularly strong use of the IBM personal machine. However, the machine is apparently finding use in many other sectors, including manufacturing, communications/utilities, and government. The corporate market for personal computers is far from saturated, and it appears that second-round purchases by corporations are generally larger than first rounds.

Virtually all vendors of personal computers—24 different suppliers are tabulated—find their machine in use as office systems and standalone business systems. Commodore was the major exception, finding a stronger use in education.

Software availability is still the most important criterion among respondents for choosing personal computer hardware, according to 63.8% of the survey's respondents. Following it are compatibility (48.1%), price (41.6%), and product reputation (41.1%). Where last year's survey indicated a 53% measure for price, this year's results suggest users are now choosing machines more by function than by raw pricing. The vendors whose users indicated price as the leading factor in vendor selection were Altos, Atari, Commodore, Kaypro, Osborne, Televideo, Texas Instruments, and Victor Technologies.

Product reputation and software availability are the IBM personal computer's major strengths, garnering 50% and 67%, respectively, of the mentions among respondents. The product is also the machine of choice at larger organizations, beating out Apple and DEC by a wide margin.

Large volume purchases of personal computers are more likely to be made centrally than locally, particularly by users of Wang, IBM, and DEC machines.

However, DEC and HP personal computers are more likely to be acquired directly from the manufacturer. While 68% of IBM sites and 74% of Apple sites purchased systems from independent stores, 58% of DEC sites and 64% of HP sites deal with the vendor directly. This indicates that shelf space in retail stores is still vitally important to sales of personal computers and that despite its best efforts to organize a national accounts program, Apple is still heavily dependent upon local shops.

Just under a third of all respondents in this year's survey said their organizations have standardized (or will do so soon) on one or two PC vendors. For companies with revenues of over $50 million, however, about 46% have standardized.

Of those selecting an approved vendor, 48% have chosen IBM, compared to 15% for Apple, and 8% for DEC. HP follows with 5%, while Tandy scored 4%, IBM-compatibles scored 3%, and Wang came in with 2%.

An organization's choice of mainframe vendor also seems to be a strong factor in the choice of personal computers. For instance, among IBM mainframe sites, 58.1% opted to standardize on IBM's personal computer. That number drops to 36% where other mainframes are installed and 41.4% where no mainframe is present. Apple's standing as the PC standard among IBM mainframe sites is 14.2%.

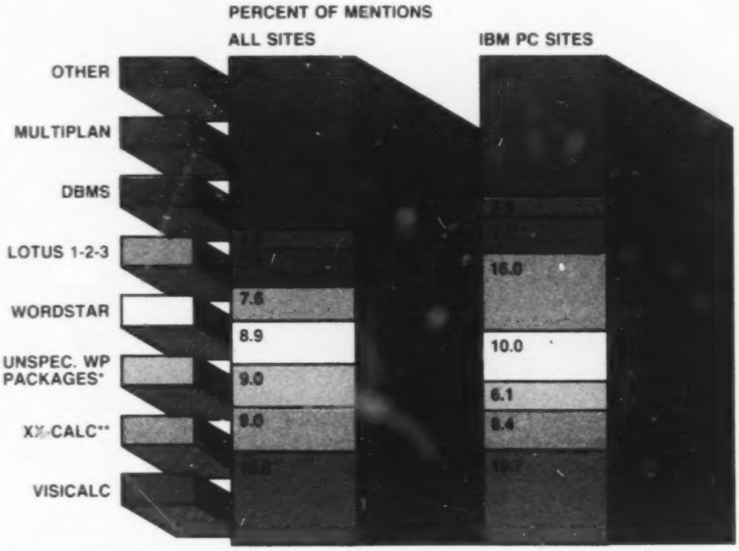
IBM's share of installed personal computer sites is up to 35.4% this year, compared with 13.1% last year, contrasting with Apple's current share of 23.6% down from 39% last year and Tandy's plummet to 9.3% this year from 17.5% last year. DEC has a 5.7% share this year, up from 1.7% a year ago.

In fact, IBM and, less so, DEC are putting the squeeze on other personal computer suppliers. Among those sites planning to purchase personal machines in the com-

FIG. 4

MOST POPULAR MICRO SOFTWARE PACKAGES

Query: Regarding your organization's personal computer software usage, what are your two primarily employed (already installed) applications software packages?

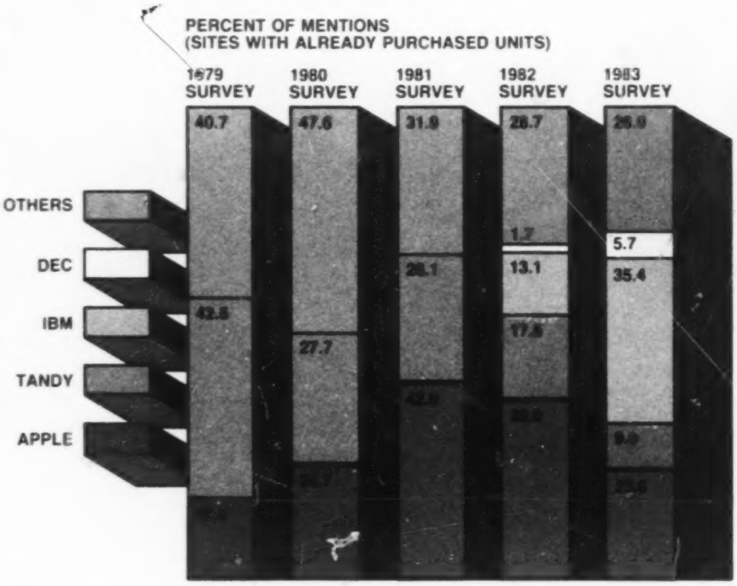


*Excludes Scripsit (1.1% of All Sites mentions), Easywriter (1.1%), etc.

**Includes SuperCalc (3.8% of All Sites mentions)

FIG. 5

IBM'S LEAD IN PCs INSTALLED



After consistent previous rise and leveling off in 1982 (the first full year of IBM PC deliveries), 1983 survey shows Apple share downshifting to state of decline.

"Others" includes HP (5.0%, down from 6.3% in 1982), Commodore 2.1%, Osborne 1.9%, Zenith 1.2%, Kaypro 1.0%, Victor 1.0%, TI 1.0%, etc. (the rest all less than 1.0%)

ing year, 51% have chosen IBM and 8% DEC. These numbers are up from 24% and 6% portions of planned purchases last year, respectively. Apple's share shrank from 28% last year to 13% this year.

It appears that DEC has made little headway with its personal computers outside of its own minicomputer user base. This contrasts with IBM's astounding dominance among Data General sites (where it has been chosen by 50% of respondents), HP (34.6%), and Wang (40.4%). So far, Hewlett-Packard is also largely confined to its own minicomputer base.

Of DEC minicomputer sites, the company has 26.6% planning to buy its personal computers in the coming year, just down from the 28.3% who did so in the last 18 months. Among those same sites, IBM had a 15.5% share in the past 18 months and a 41.2% in the coming 18 months. In contrast, 52.9% of current IBM minicomputer sites had installed IBM's personal computer in 1982-83, while a whopping 82.3% plan to install the IBM personal machines in the coming year and a half.

The survey data were inauspicious for Apple Computer's Lisa workstation, which was introduced last January after much industry speculation. Only 4% of the total Apple purchases planned through 1984 are for Lisa systems. Planned purchases of DEC personal computers break down as follows: 37% Rainbow, 30% DECmate, and 33% Professional.

Growth in spending for software is outpacing that for personal hardware. In the last 12 months, the split between software and hardware was 16.4% soft and 83.6% hard. In the coming months respondents indicated their purchases would be 20.7% soft and 79.3% hard.

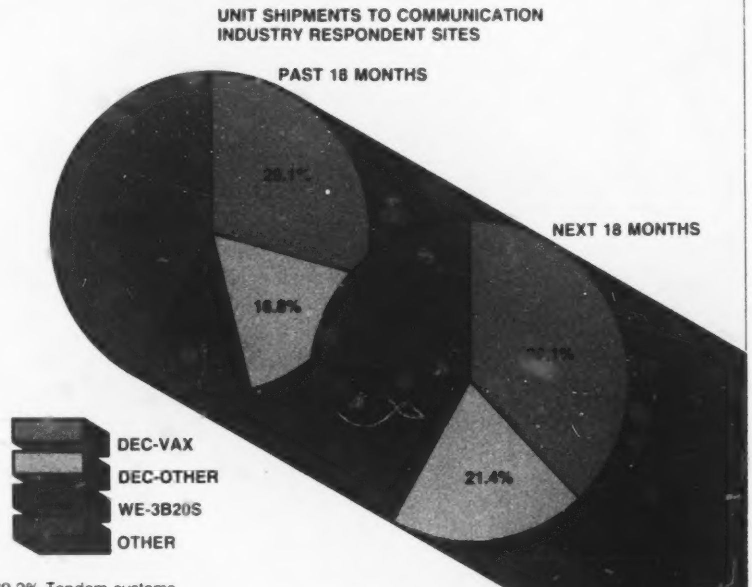
A handful of popular software packages account for about 70% of applications on respondents' personal computers. The leader remains VisiCalc, followed by Lotus 1-2-3, Wordstar, other "Calcs," and database packages. This finding leaves unanswered the question of whether any dramatically new software for personal computers other than what is currently available will be found. It also raises the possibility of vendors beginning to bundle their machines with software, according to Cowen analysts.

As for the minicomputer market, survey data project an upturn in overall sales in the coming year, but market growth will be far from the rates enjoyed when the industry emerged from the recession of 1974–75.

In terms of year-to-year expansion, this year's survey indicates only 7% growth in the domestic minicomputer-user population. This number supports the observation that new users are a decreasingly material source of minicomputer industry growth, a sign of the industry's maturation. The slowdown is evident in all segments of the in-

FIG. 6

WESTERN ELECTRIC 3B20S GAINS MARKET SHARE

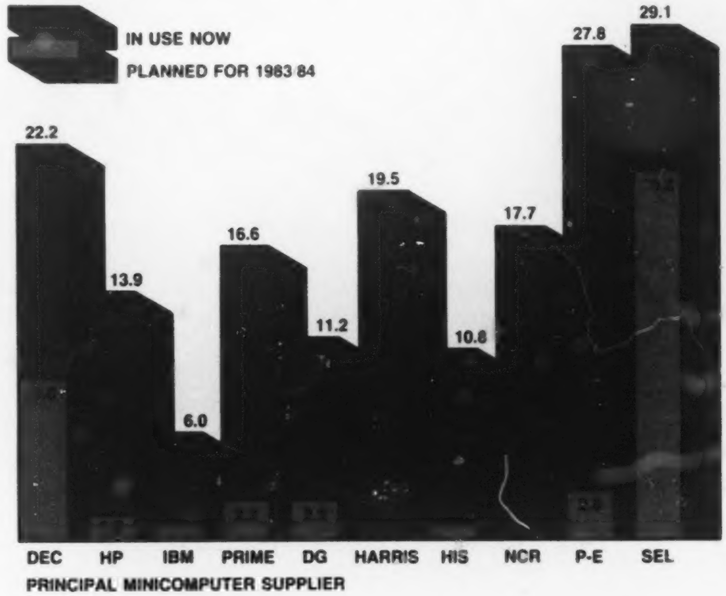


*9.2% Tandem systems

Western Electric itself a sizable user of 3B20S systems, but counted in Electrical Machinery SIC rather than in Communication SIC.

FIG. 7

SIGNIFICANT GAINS AHEAD FOR UNIX



Western Electric 3B20S population 100% Unix based dustry measured: small business systems, traditional minis, intelligent terminals, data entry systems, and office systems.

Moreover, a trend observed in recent years of users consolidating their purchasing activities to a small number of current suppliers was further evident in this year's data. In all categories of the minicomputer market, respondents indicated that they are increasingly considering only one vendor, their current one, in buying new minis. For instance, among those buying traditional minis, 41% of those responding looked at only one vendor.

With few exceptions, Digital Equipment was the most frequently cited close competitor in multi-vendor procurements. Fully a half of those eventually choosing Data General hardware, for instance, also looked at DEC hardware. Even among IBM buyers, 24.1% considered DEC equipment.

The highest incidence of noncompetitive, one-supplier procurements went to Western Electric, DEC, and IBM. (Western Electric was counted in the survey for the first time this year, its 3B20s and 3B5 machines all showing up at AT&T sites.) In multiple supplier procurements, DEC and IBM were winners more often than not, followed by Hewlett-Packard.

Among the traditional minicomputer suppliers, HP was found to capture much more of its users' peripherals add-on business than Data General or DEC. Almost 83% of HP respondents chose HP peripherals, compared to only 58.7% for Data General and 58.1% for DEC. IBM respondents ranked in at 72.2%. Overall, however, the survey showed a continuing yearly trend of less peripherals business going to systems suppliers: this year only 61.4% of such business went to primary systems suppliers, while the comparable figure for 1981 was 73.8%.

The strongest small-systems peripherals shipment growth this year, as last year, was indicated for low-end rigid disk drives (up 219.1% over the previous 12 months) and color graphics terminals (up 131.1%). Add-on memory, serial printers, and monochrome terminals also showed strong growth.

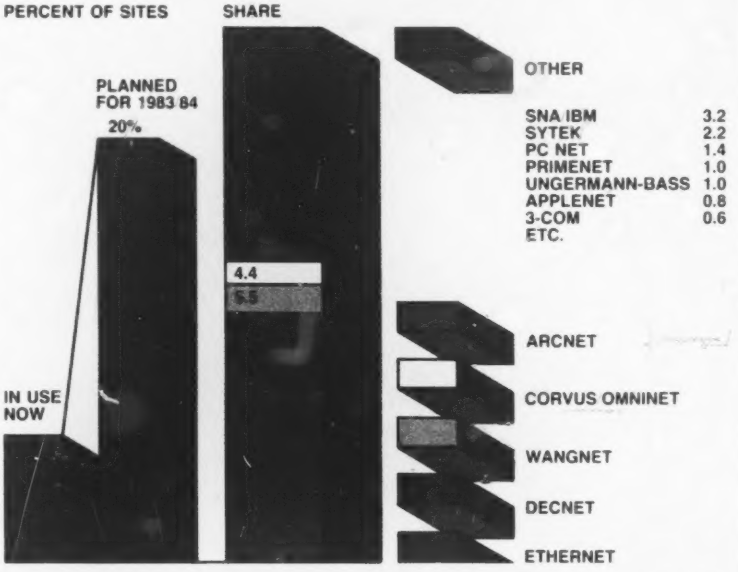
The growth in small rigid disk drives—less than 15 megabytes—was attributed primarily to the IBM XT personal computers. Fully 53% of those respondents indicating they were purchasing a personal computer of some sort said they would also buy a small hard disk. Meanwhile, 83% of those users were shopping for a printer, 79% for a monitor, and 82% for a floppy disk. Epson and DEC led the way in share of serial printer purchases for the coming 18 months, while IBM and DEC were tops in crt terminals.

Disk storage on minicomputers rose a small amount this year, to an average of 275 megabytes, which works out to a better

FIG. 8

LOCAL NETWORK IMPLEMENTATIONS TO TRIPLE

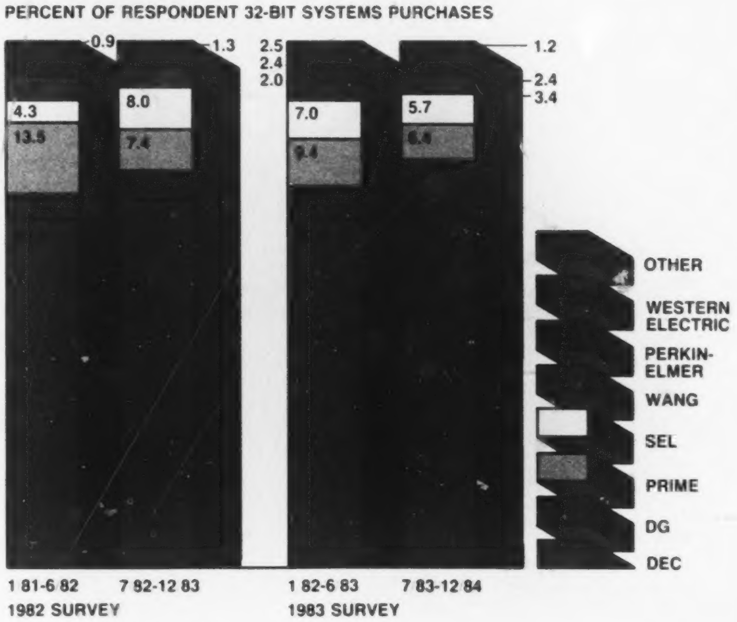
Query: Any plans to install a non-phone local area network (such as Ethernet)?



A minority of respondents still indicate some confusion regarding the definition of local area network. Ethernet by far most frequently cited.

FIG. 9

LEVELING OFF IN DEC SHARE OF 32-BIT SYSTEMS MARKET



*4.8% from a single site large-end user purchase than 30% five-year compound growth. Tandem users indicated the largest disk usage—an average of 689MB per system.

Add-on memory showed a 50% five-year compound growth rate, amounting to an average size of 950 kilobytes per system this year. Last year's number was 551 kilobytes.

However, the rise in microprocessor-based memories is rising even faster, at 63% for a three-year compound rate compared to a similarly measured rate of 44% for minicomputers. The average desktop machine now has 186 kilobytes attached.

Turning to the outlook for minicomputer purchases, the survey found an unambiguous upturn for the positive. For instance, after three years of falling, the number of oem/systems house respondents claiming their on-hand inventories were "too low" took a jump from 8% to 11%. Apparently, those resellers in the business and commercial market had a lower supply of machines than those involved in technical applications. The implication, of course, is that oem/systems houses soon expect to purchase machines, because they perceive business coming their way.

Another measure of the positive outlook came from a decided drop in the number of end-user and reseller sites admitting they had delayed or cancelled orders for minicomputers previously scheduled for delivery in 1983. According to Cowen analysts, the number of sites indicating such rescheduling of orders dropped to prerecession levels.

Even more encouraging for vendors was the relatively stable minicomputer pricing foreseen in the coming year among oems and systems houses. This came after a year of "soft pricing" in which vendors—particularly Prime Computer and Texas Instruments—slashed prices to increase sales.

The respondents' planned minicomputer purchases through 1984 show IBM garnering a 16.4% share of total spending compared to DEC's 36.1%. HP and Data General follow with 8.3% and 8.2%.

Overall minicomputer shipments will increase in dollar terms by about 14%, without taking into account revenues from service, terminals, personal computers, and other equipment sold by minicomputer makers, according to the survey. While this growth rate is better than the 12.5% projected in a similar survey last year, it is nowhere near the 117% growth foreseen for personal computer shipments. These two figures combined work out to a total minicomputer/personal computer industry increase of about 30%.

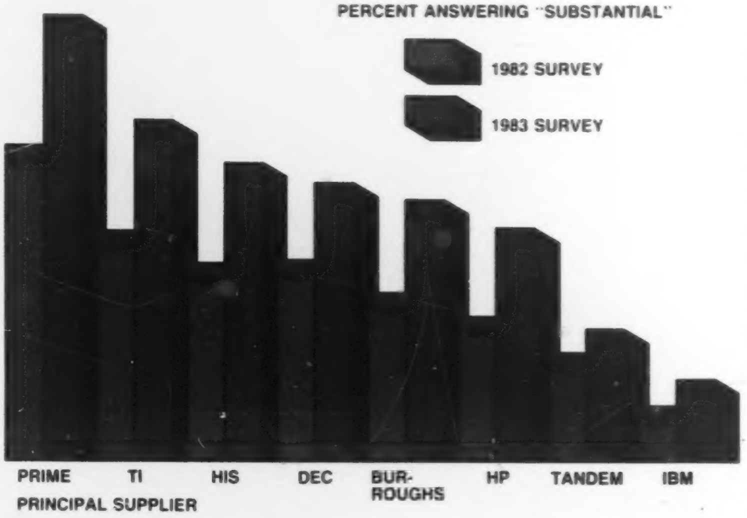
The weakest growth is foreseen in the traditional minicomputer market, which has been most affected by the personal computer. Small business systems shipments will rise, on the other hand, as will data entry and office systems.

Some additional observations:

FIG. 10

MINICOMPUTER PRICE DISCOUNTS ON THE UPSWING

Query: How big a price concession (above and beyond any normal quantity discount) did you receive when acquiring your last minicomputer system(s)?



Survey shows relatively stable pricing behavior for Wang, Data General, and Perkin-Elmer relative to year earlier.

- Interest in nonstop computer systems was even higher in this year's survey than in last year's. Superminicomputer sites were most interested, but the concern with remaining compatible with current systems was quite pronounced. This may mean that newcomers to the fault-tolerant market pioneered by Tandem Computers will have a rough time convincing buyers to install machines built with obscure architectures.
- The 32-bit segment of the minicomputer market is by far the strongest, showing an expected 46.2% share of respondents' total minicomputer purchases planned for the 18 months following the survey date.
- DEC's two-thirds share of the 32-bit market is leveling off among survey respondents, while Data General appears to be gaining share. Prime slipped a few points. DEC, it would appear, will soon have to replace the now six-year-old VAX-11/780 as the top end of its 32-bit line.
- Data General has enjoyed a strong reception for its high-end MV/10000 machine. Respondents indicated that 41.5% of the dollars they spend on DG's 32-bit machines will be for the model 10000.
- Western Electric is soon to become a contender in the minicomputer market, through its Unix operating system and its line of 32-bit minicomputer systems. Among respondents in the communications industry, 16.7% of minicomputer shipments will be the WE hardware. Unix usage is currently found primarily in DEC sites, but the highest rate of new use is expected to come from HP and IBM sites.
- DEC and IBM are doing particularly well in the distributed processing arena, accounting for about 50% of current ddp use and just over 60% of planned use. In contrast, Datapoint's share is showing a dramatic decline.

To summarize:

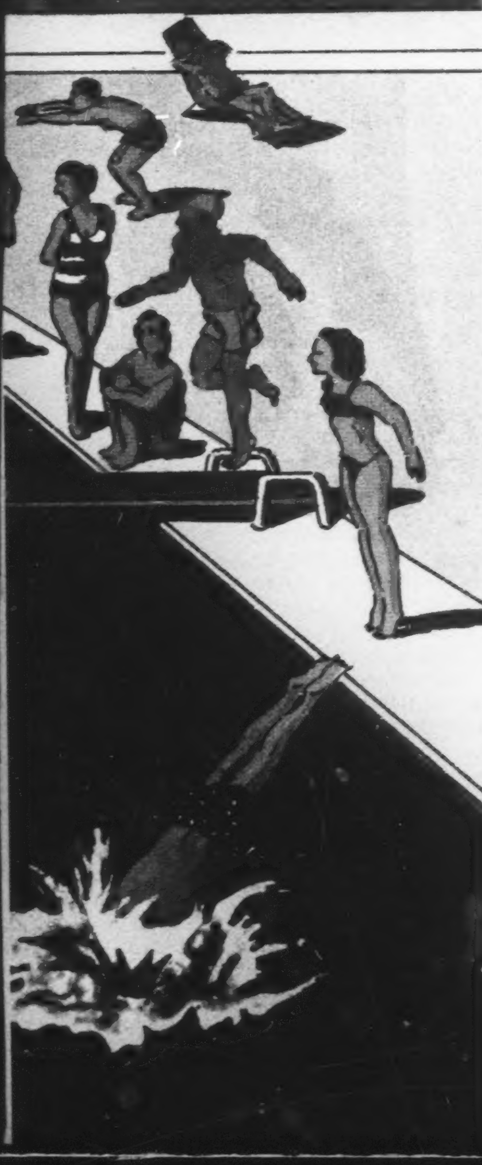
- The emergence of the IBM personal computer as an industry standard has ominous implications for differentiated suppliers. However, it is still incumbent upon traditional systems suppliers to participate in the personal computing segment, as well as in the relatively healthy high end of the minicomputer market to protect against competitive incursions and for growth.
- Peripherals, packaged software, and integrated circuit vendors are seemingly the beneficiaries of the overall growth trend, regardless of the competitive outcome on the systems side.
- The minicomputer industry may only be experiencing a cyclical upswing, and its future strength may be seriously weakened by incursions by the personal computer and other micro-based systems.

To order copies of the full DATAMATION/Cowen survey, call Debbie Mitchell at (212) 605-9722. The price is $795.

When end users take the personal computing plunge, dp managers find the water more roiled than ever. But it says here they expect to make things work swimmingly.

MICROS AT BIG FIRMS: A SURVEY

by Data Decisions



Corporate employees, as everyone knows, have embraced personal computing with a passion, and the trend is expected to accelerate. But for the corporations, and especially for their dp departments, the little machines still seem to raise more questions than they answer. What, exactly, are micros accomplishing today? What might they accomplish tomorrow, and how will organizations get there from here? And what role do dp managers expect to play as their companies make fundamental changes in the way they handle information?

For answers to these and other questions, Data Decisions recently surveyed dp managers at a thousand corporate and institutional installations. The results overturn some perceptions on the use of personal computers in big companies and on the attitudes of the professionals who dictate their use.

The installations surveyed represent a cross section of American business; the top three categories were manufacturing, financial/insurance, and transportation/utility. The average number of employees at these sites was over 1,900, and all own or lease computer equipment with equivalent monthly dp rental charges in excess of $50,000. (For more detail on how the survey was conducted, see box, p. 174)

The questions were designed to find out how and where personal computers are being used in large installations and to explore the attitude of the dp manager toward their use. The survey went out to dp managers at 2,000 organizations. Over 50% responded, often with lengthy comments and other indications that this is indeed a critical topic. The respondents were opinionated and interested. They were also knowledgeable; even for the most difficult questions concerning current usage patterns, over 80% of the participants responded. Their answers provide some startling insights into what is important in the corporate use of PCs.

The attitude of the data processing organization has a major influence on the use of personal computers in large corporations. While there is some indication from their comments that certain dp managers are merely accepting the inevitable, in most cases the attitude is overwhelmingly positive. A solid 59% of the dp managers reported that they were favorably disposed to the use of personal computers by non-dp personnel. An additional 34% were "somewhat favorable"; 4% were somewhat unfavorably disposed, and only 2% had strong objections. This favorable attitude is fortunate since 82% of the managers reported some personal computers in use at their locations.

Participants were asked to disregard their own attitudes and list what they saw as the advantages and disadvantages of PC use. The most significant benefit, cited by 44% of the respondents, was improved management or professional productivity. One way dp managers expect micros to address this problem is by taking over a "backlog of small but useful applications needs that cannot be addressed by data processing professionals, because the volume of applications is too great." Another manager felt that the micro's chief value lay in its "ability to be interactive and experiment" in cases where the user can't define the exact boundaries of the job. Computer literacy was also cited as an avenue through which productivity could be improved, underscoring the almost universal attitude of dp managers that computers will play a vital role in all aspects of corporate operation in the years ahead. "The personal computer will familiarize users with computer concepts," suggested a dp manager who strongly supports using personal computers.

Some comments on computer literacy suggested that dp managers were not altogether sorry to see users experience the problems that come with computers. One respondent noted that "users would get more

ILLUSTRATION BY ANDREA BARUFFI

Data security and control of sensitive information ranked as the top problem anticipated by dp managers.

FIG. 1

ROLE OF DP DEPARTMENT IN PURCHASE BY USER DEPARTMENTS (%)

ROLE	CURRENT[1]	EXPECTED IN ONE YEAR[1]	IDEAL[2]
Mandate which system to buy	18	19	20
Participate in decision	48	57	70
No official voice but promote dp department as source of information/advice	16	11	8
No official voice; offer information/advice only when asked	9	3	1
No role	3	1	*
No answer	6	9	1

[1] Base: other departments are using PCs.
[2] Base: all respondents
*Less than 0.5%

familiar with data processing problems, frustrations, capabilities, etc., which in itself will help to promote better feelings and better understanding of data processing." Programming was an area of particular sensitivity. Working out their own applications, according to one manager, "makes users aware that all applications are not simple."

A second major benefit is felt to be a reduction in the dp workload, both from a programming and an operations perspective. Twenty-nine percent of the dp managers felt that the growth of personal computer usage would reduce the workload of the dp department. However, they had few concrete examples of exactly how this reduction would take place. One manager reported that "certain editing tasks now performed on the mainframe" could be offloaded, suggesting that personal computers might serve as local transaction editors.

CONCRETE IDEAS ON COST CUTS

In the area of programming services, the ideas on how costs might be reduced were more concrete. One manager expected micros to "assist with development of those applications that don't require access to mainframe data—sales forecasts, budgets, and maybe some modeling." Where dp development resources are significantly overextended, dp managers suggested that personal computers could help by absorbing most local applications.

Dp managers are also conscious of the advantages of personal systems for ad hoc applications. "They are easy to use where there are limited amounts of data involved," one manager reports, "so the results usually come quicker." In all, 28% of the managers saw quick access to needed information as a potential benefit. Having their own systems will give users "quicker, more personalized results." The use of spreadsheet packages to answer "what if" questions was a frequent favorite application.

The favorable attitude toward personal computers is mirrored by a general expectation that their use will ease the burdens of the dp manager in the long term. Fifty-nine percent of those surveyed felt this to be true, the same percentage that favored the use of personal computers in their corporations. An almost equal number, 60%, however, felt that their jobs would be made more difficult in the short term, primarily because of user unfamiliarity with the program and data controls that form the core of most dp department procedures.

Data security and control of sensitive information ranked as the top problem anticipated by the dp managers, with 40% expecting difficulties in these areas. "It's a security risk," one said bluntly. "Failure to audit their data or test their results will result in bad numbers," predicted another manager who expected short-term problems. A third manager, who reported being only "somewhat favorable" to personal computer use in the company and who expected this use to complicate the dp manager's job even in the long term, suggested that "their use will cause a serious loss of control over a valuable corporate asset—data."

Inconsistency of data and of the reports produced from it worries 19% of the respondents. "Confusion due to duplicate data is going to be a problem," one manager explained. The reason for this confusion? Lack of organized dataflow and audit trails. "PCs can lead to mass managerial confusion, because no one knows where the numbers came from." Dp managers also fear a certain amount of "number merchandising." As one put it, "We're going to see a proliferation of different interpretations of the same data."

Waste and cost issues were the third major area of concern, with 18% of those surveyed believing that the user was likely to waste money on the wrong purchase or misuse the equipment once it was installed. "Users tend to say 'just make it work' without a commitment to learn and understand—they want to be button pushers versus data processors," went one comment. The lack of data processing savvy is expected to result in a simplistic approach to the systems: "they'll use the device as an expensive adding machine," or "it will become a toy rather than a tool."

Related to the issue of waste is the issue of duplication of effort. Review committees to evaluate and approve individual departmental applications were not much in evidence, and once equipment was in place, this lack was felt to lead to redundant development. "The disadvantage is that everyone will try to do their own programming instead of performing the jobs they were hired to do. Duplication of effort will result," said one respondent, and 17% of the managers agreed.

BUYING: A DELICATE BALANCE

The purchase of a personal computer in a large corporation can reflect a delicate balance of influences. Users may feel that the dp organization wants to retain control over all corporate computer resources and resent dp input into what they see as a local purchase decision. Corporate management, concerned about the possibility of purchasing inferior or unsatisfactory equipment, may encourage users to seek professional advice from the internal data processing staff. "The capabilities of personal computers are oversold by the media," explained one manager.

Most managers are aware of both the responsibility to advise the user and of the natural resistance to having purchase policy dictated. While 70% of those surveyed felt that dp managers should "participate in the decision along with the manager of the acquiring department," only 20% felt that the manager should mandate which systems could be acquired. Only 9% felt that their role in the decision process was unnecessary; 8% believed that an active effort to promote the dp department as a voluntary contact point was required, and 1% felt that the dp organization should offer advice or information only if asked (see Fig. 1).

Results were less rosy when the "ideal" was compared with the current role and the role expected within one year. Progress toward the ultimate goal of participation

Interaction between PCs and mainframes or minis is clearly regarded as the wave of the future.

can be measured by a shift in role from the unofficial "influence," which conjures up images of meetings in cafeterias and smoke-filled rooms, to a formal joint responsibility. Within one year, three out of four managers expect to take an active role, but currently nearly one in ten limits involvement merely to answering questions if asked.

Where the dp manager has input to the decision process, that input usually takes the form of guidelines. Seventy-three percent of those surveyed provide a list of recommended makes/models, and the same percentage offer selection guidelines for users. Slightly over half (56%) offer guidance on the languages the systems should support. This response is significant because it may constitute acceptance of a user programming role by a majority of dp managers and, perhaps, contradict the assumption that end users are to be relegated to packaged programs such as word processors and spreadsheets.

What factors do the dp managers consider most important in the selection of micros? Fig. 2 shows what proportion of the dp managers rated each factor very important and what the average score was for each.

Analysis of the responses suggests that dp managers' primary concern is that the system selected be suited to the initial application. Software support for it (the most important factor) and ease of system use (the second) would combine to provide the user with an easy transition. The next level of concern involves expansion/upgrade capability for both hardware and software and the so-called "management issues"—compatibility (by only a slim margin of 54% to 44% the majority of managers feel that the result of a selection process will be a single vendor to serve all user needs), vendor reputation, service, and training. Cost and technical features, such as memory size and disk capacity, are considered the least important factors.

In summary, the dp manager's attitude toward the decision process is often refreshingly nontechnical. As one respondent put it, "Get them something they can use now so the system will cost-justify, be sure it can be adapted to other applications, then worry about traditional dp factors."

The actual role played by the dp manager seems to fall short of the goal of being a full participant in the purchase decision. Many managers were not even aware of which employees used personal computers at their installations. Only 25% felt they knew where all personal computers were being used; 33% could account for most of the systems, 21% for some. Three percent said there are PCs at their sites, but they don't know where or how they are being used; 8% were not sure whether systems were in use or not, and 13% were sure that none were.

FIG. 2

IMPORTANCE OF SELECTION FACTORS

SELECTION FACTOR	% RATING FACTOR AS VERY IMPORTANT	AVERAGE SCORE (1-5)
Available software packages for current applications	65	4.57
Ease of use	56	4.48
Compatibility with existing mainframe, mini, or micro computers	56	4.37
Availability of large number of software packages	53	4.35
Vendor reliability/reputation	48	4.30
Quality of service available	44	4.24
Expansion/upgrade capability	34	4.07
Quality of training available from vendor/seller	25	3.72
Compatibility with existing PC peripherals	23	3.66
Current use of same model by others in company	21	3.62
Cost of system	17	3.54
Ability to get service from another vendor already on site	13	3.14
Amount of processor memory	12	3.55
Mass storage available	12	3.43

FIG. 3

INFLUENCE IN DECIDING WHICH PCS ARE ACQUIRED BY NON-DP DEPARTMENTS (%)

	INFLUENCE			
DECISION MAKER	GREAT DEAL	FAIR AMOUNT	LITTLE OR NONE	NO ANSWER
Data processing department	47	29	17	7
Manager of the individual department	36	39	18	7
Individual user(s)	26	38	26	10
Central purchasing department	6	14	69	11

One reason for this lack of knowledge may be related to the issue of budget purchase authority. The dp department in a large organization is unlikely to be the direct source of funds for the purchase of personal computers. Forty-three percent of the managers at sites where other departments use personal computers say they are always paid for out of the user department's budget; another 24% indicate that this is usually the case.

Although this undoubtedly influences how much say the dp department has in the purchase of personal computers by user departments, when it does play an advisory role, its influence is appreciable. Fig. 3 shows how dp managers perceive their comparative influence.

The acceptance of dp input into the decision process is not the only place where reality trails expectations. Dp managers were asked to identify the areas where the dp organizations *should* provide user services, and

Although computers are moving into the executive suites, they are not moving out of the lab.

then those they service currently and those they expect to support within a year. The views shown in Fig. 4 indicate the role dp organizations feel they should play in the after-purchase support of personal computers and offer a glimpse of the dp manager's views on general policies in the use of PCs.

FIG. 4

USER SERVICES PROVIDED BY THE DP DEPARTMENT (%)

SERVICE AREA	SUPPORT NOW[1]	EXPECT TO SUPPORT YEAR FROM NOW[1]	SHOULD SUPPORT[2]
Training and consulting	63	69	88
Identifying application packages	59	61	69
Providing central data access	44	74	90
Bringing up new applications	30	39	40
Hardware maintenance	24	30	44
None of the above/no answer	22	16	3

[1] Base: other departments are using PCs
[2] Base: all respondents

FIG. 5

USE OF PCS IN SPECIFIC DEPARTMENTS

DEPARTMENT	% REPORTING PC USE	AVERAGE NUMBER IN USE
Data Processing	91	5
Accounting	67	4
Research	44	9
Marketing	36	3
Manufacturing	27	5
Personnel	26	3
Sales	21	7
All Other	46	8

FALL SHORT OF GOALS

Dp managers fall short of their goals in all areas, but nowhere is the difference more dramatic than in central database support. Interaction between personal computers and the installation's mainframe or minicomputer is clearly regarded as the wave of the future, with nine out of 10 dp managers advocating that the department help PC users access central databases. Currently, however, only 44% of the managers at sites where non-dp departments use PCs claim they are able to provide this service. On the other hand, 74% expect to do so within a year.

The very high score given to the issues of central data access also reflects the dp managers' views on the future role of personal computers. A clear separation of functions is expected, with the PCs providing remote processing services against a centrally maintained and supplied database. A PC may thus replace an intelligent terminal, providing remote access but also offloading some processing functions.

This relationship is confirmed by the managers' perceptions of the effects of personal computer selections on the use of intelligent terminals. When asked how often they recommended personal computers in an application where an intelligent terminal would have been recommended two years ago, 21% reported having done so frequently and 41% occasionally. Only 28% rarely or never did so.

The replacement of intelligent terminals raises issues of protocols and compatibility at the connection level. Some dp managers felt that insufficient attention was paid to the problem, and they foresee a heavy penalty for this failure. "Incompatible equipment," reports one dp manager, "will stymie eventually tying everything together in a network." Another is more specific: "There's a real danger if you don't control the protocol used. We happen to be an SNA shop!"

Uncertainties about the role of the dp organization do not seem to be affecting the rate at which dp managers in large companies expect their use of personal computers to expand. When asked what trends in usage they anticipate, 72% of the respondents predicted internal dp department use would increase, while 88% thought other departments' use would rise.

The fact that dp managers are more likely to foresee growth in PC applications outside their own departments than within does not mean that PCs are considered unsuitable for the dp organization. When they were asked to provide a profile of the current use of personal computers within their corporations, 91% of the dp managers at installations where PCs are currently in use reported use by the dp department. This was the highest percentage of any corporate department.

Fig. 5 shows the extent to which personal computers have moved from use as specialist tools into the mainstream of the business. When the managers at sites using PCs were asked whether and how many personal computers were used in specified departments, the response demonstrated a significant growth in nontechnical areas. However, the numbers also show that though computers are moving into the executive suites they are not moving out of the lab.

FIG. 6

PC USE BY JOB LEVEL (%)

JOB LEVEL	DP DEPT.	NON-DP DEPTS.
Middle Management	63	67
Clerical	38	47
Upper Management	24	22
Professional, Other	21	20

If the use of personal computers can be classified by department, it can also be classified by the job level of users. One key question in the growth of personal computer use is the extent to which the systems are being applied directly to high-level decision support. Penetration of the higher management levels by PCs is, in part, a tribute to the effectiveness of recent software designed for management use. While clerical use of systems is by no means unknown, management support applications now dominate. Both

Comparison of current usage with that expected within a year does not suggest a major shift in applications.

outside and within the dp organization, the PC is clearly a management tool.

Are the uses to which personal computers are put satisfying the expectations of the dp manager? The managers had expected PCs to improve productivity, reduce mainframe workload, and provide faster access to data. What specifically is being done with the systems, and what is expected within the next year?

As shown in Fig. 7, use of personal computers is expected to grow in all areas except the catchall undefined category. The most dramatic growth areas are all related to the substitution of personal computer power for mainframe power, and the highest growth rate is expected in the area of offloading small programs and related data from the main computer.

If this prediction is correlated with the fact that the majority of personal computer users are expected to be management personnel, it indicates an expected increase in the demand for management decision support applications. The fact that so much is expected of personal computers in the area of replacing programs currently run on mainframes may explain the willingness of dp managers to recommend which programming language should be selected by end users.

Word processing and graphics production, applicable to both management and clerical users, are also expected to show significant growth in both data processing departments and user areas. Replacement of outside timesharing services, while not impressive in total expectations, nevertheless shows a very high growth rate. Since this area represents a direct cash outflow to a corporation, it could provide cost justification to fund the further expansion of personal computer use. Comparison of current usage with that expected within a year does not suggest major shifts in applications; the attitude is "the same things, but more of them."

FIG. 7

CURRENT VS. ANTICIPATED USE (%)

	USES OF PERSONAL COMPUTERS			
	DP		NON-DP	
FUNCTIONS	NOW	IN ONE YEAR	NOW	IN ONE YEAR
New applications not suitable for mainframe	41	54	73	82
Word processing	39	53	55	71
Production of graphics	26	48	36	65
Offload current applications	24	54	30	69
New applications that would have gone on mainframe	22	36	51	63
Bring outside timesharing under in-house control	5	16	21	33
Other	17	15	14	13

FIG. 8

PC BRANDS IN USE: PRINCIPAL MENTIONS (%)

	FREQUENCY REPORTED	
MANUFACTURER	WITHIN DP DEPT.	IN OTHER DEPTS.
IBM	55	57
Apple	25	46
Radio Shack	10	23
Digital Equip. (DEC)	4	10
Hewlett-Packard	5	9
Commodore	2	7
Osborne	4	6
Wang	3	5
Texas Instruments	2	4
Xerox	2	3
Victor	1	3
Altos	1	2
Heath/Zenith	1	2

PROBLEMS CREATING STANDARDS

The expected rapid growth in PC use has many dp managers worried about standardization. "There is a potential lack of equipment standards," one manager suggested. "We'll have a proliferation of micro vendors in a company and dp will have to support them all," explained another. However, while a bare majority (54%) of the respondents thought their companies should standardize on a single make of personal computer, a substantial (44%) want to acquire more than one make in order to take advantage of different vendors' strengths.

Competition among vendors has been intense, especially since the introduction of the IBM Personal Computer. A survey of the dp managers on the equipment currently in place both within the dp organization and in other departments provided not only an indication of brand preference among the very large corporations, but also showed the extent to which standardization is currently in effect (see Fig. 8). Non-dp departments are clearly less committed to a single vendor. While the IBM P.C. is used by more than twice as many dp departments as any other brand, it has a much narrower lead among non-dp departments. Dp departments were also less likely to experiment with new systems. The DEC computer was more than twice as common in non-dp departments.

It is difficult to interpret these differences. If the non-dp use of micros represents an earlier trend in purchase, when little control was exercised, the diversity could be construed as the result of uncoordinated purchasing.

Another possible reason for the number of vendors is the failure to integrate personal computers with other systems. In the average dp department using PCs, 58% of the machines are used only as standalone systems; in other departments the number is even higher—79%. These high percentages

There has been a dramatic increase in the use of personal computers in large corporations, the survey shows.

almost belie the fact that a full 90% of the dp managers rated providing access to centralized data as an objective of their organization. Perhaps providing central data access is a philosophical goal rather than a practical one; only 7% of the dp managers felt that providing users with assistance in networking or communication was a reasonable goal for the dp organization.

The survey of large corporations clearly shows a dramatic increase in the use of personal computers and indicates that the major beneficiaries of the systems will be management and professional personnel. The expected surge is already being watched by the software suppliers, and the sudden increase in all-purpose executive packages that combine word processing, database, spreadsheet, and other applications is one result.

The effects of the growth in corporate America's personal computer use are overwhelmingly perceived to be positive—increasing productivity and providing users with faster access to results. But in the short term, major problems in employing these little powerhouses may occur. Some are a natural result of a sudden increase in the perceived benefits of the systems, spurring an explosion in purchasing without providing time to establish a framework for their selection and acquisition. One dp manager ruefully compared the task of guiding personal computer selection to that of "directing an avalanche."

Some of the frustrations felt by dp managers are reflected in their comments and in the majority view that personal computers in the hands of end users will make their jobs more difficult in the short term. Many dp managers view the user community as lacking in computer knowledge (probably true), somewhat hostile toward the dp organization (almost certainly true), and therefore inclined to go it alone, given the chance. This latter fear seems groundless in the large businesses—there is simply too much at stake and everyone realizes it. While one dp manager is concerned lest the "hotshots attempt to make micros do what we are doing well on a larger system," the majority seem to realize that the user managers have no time to become a dp department, even if they had the inclination.

Unfortunately, lack of familiarity with even the most fundamental concepts of data processing can be as damaging to the decision process as deliberate obstruction of corporate data processing policy. This fact makes the centralized control of PC purchases vital if a cohesive, cost-effective corporate information policy is to have any hope of long-term success. While administrative controls may be a partial answer to the immediate problem, the dp managers seem to agree that the best answer is strong dp support for a rational policy of selection and use.

METHODOLOGY

The object of this survey, which was designed by Data Decisions and conducted by Beta Research Corporation, Syosset, N.Y., was to collect information on the use of personal computers in an institutional or corporate environment.

The universe for the survey consists of installations that have purchased or leased computer equipment with equivalent monthly rental fees that exceed $50,000. These installations were identified using the database maintained by Computer Intelligence Corp., La Jolla, Calif., a sister company of Data Decisions. At the time the sample was drawn, the universe consisted of 3,226 sites (7% of all U.S. sites in the entire Computer Intelligence database).

A random sample of 2,000 sites was selected on an nth name basis. On April 22, 1983, questionnaires were mailed to the data processing manager or MIS director at each site. A $1 incentive and postage-paid return envelope were included in the mailing. On May 18, a follow-up mailing was made to all nonrespondents. A total of 898 mail returns were received. During the weeks of June 20 and June 27, 1983, telephone interviews were conducted with 103 nonrespondents, bringing the total number of responses to 1,001, for an overall response rate of 50%.

The organizations surveyed represent a good cross section of U.S. dp sites:

Manufacturing	25%
Financial/insurance	18
Transportation/util.	8
Retail/wholesale	7
State/local govt.	7
College/universities	6
Non-mfg. business	4
Communication	3
Federal govt.	3
Medical	3
School district	2
Professional	1
Other	13

CENTRAL CONTROL OF DATA

It appears that the greatest challenge faced by the dp organization, and therefore by the large corporation, is the provision of central data access through mainframe-microcomputer networks. Lack of central control and inconsistent data were rated as serious problems, and 90% of all dp managers felt that central data maintenance and supply should be a key part of the dp department support policy for small computers. Yet, according to these same managers, standalone systems outnumber networked systems by over two to one, a wide margin.

Will the manager of the future use personal computers to digest and display the kinds of high-level information required for supporting major corporate decisions, or will that manager become more and more isolated by a mass of unconfirmed and uncorrelated data? As one dp manager put it, "How many different monthly sales figures can possibly be correct? Only one, obviously. But that's not how many we are going to have."

The personal computer revolution, like other computer revolutions before it, will be assimilated into the back office as well as the boardroom. By providing offerings in the microcomputer area, large system vendors such as IBM and DEC tend to tie together the user's information-management components. The success of the "you got the big one from me, now get the small one from me" strategy is obvious in the growth of the IBM P.C. from its introduction in 1981 to an estimated annual production of 600,000 units only two years later. That success is already changing the attitudes of other vendors, and even software companies are hurrying to provide offerings that integrate mainframes and micros into a package so tight it is difficult for the user to know where the information is and which system is handling it. If today's average non-dp user in a major corporation is uncertain about the alternatives, the trend toward product integration in the market is so well publicized that it will be hard for such a person to remain so.

The dp manager, for all the suspicions about the attitude and level of expertise of the user, is a professional at information management and is prepared to admit that the small computer has a large place in the corporation. As one manager put it, "Because of the complexity of our 'groups' of programmers, our standards, our procedural red tape, small jobs sometimes become bogged down. Faster turnaround could be helpful to many departments and to the company as a whole." With luck in the short term and with the proper planning and strategic foundations for the future, the personal computer seems assured of a major place in America's biggest businesses. ◆

Data Decisions is a research and consulting firm that publishes monthly updated information services on [illegible]puter systems, communication systems, and software. It also provides custom research studies and on-line access to information on the full spectrum of information processing products and services. For specific information, contact Data Decisions, 20 Brace Road, Cherry Hill, NJ 08540; (609) 429-7100.

More than 100 computer-oriented companies have gone public in the last year, and there're more to come.

AN EXCESS OF MONEY

by Larry Marion

"Those guys were more interested in shipping product than in fixing its problems," grumbles the president of a small manufacturing company in Southern California. He bought an office automation system from a company that went public earlier this year, before its software was ready. "We finally went to them and asked for the Unix utilities, so that we could fix the problem ourselves," says the disgusted customer.

Many dp managers have faced a similar problem, or have at least muttered a few oaths about the new desktop system bought from a startup company anxious to bolster revenues to raise money on Wall Street. For the dp managers besieged by salesmen selling yet another 16-bit microcomputer, there's bad news on the horizon: the proliferation of computers is likely to get worse over the next two years, because the public is eager to buy stock in computer companies, even those that are relatively unproven. "A lot of companies are getting funded which shouldn't, due to an excess of money," says venture capitalist Benjamin Rosen, who raised $85 million to invest in new companies.

In the past 12 months through early September, 115 computer companies succeeded in selling stock to the public, according to a search of Securities and Exchange Commission files by Securities Data Co., New York. The underwriters of the computer stock offerings collectively pulled in roughly $2.4 billion from investors or their own accounts; dozens of other computer companies went public without an underwriter making a firm commitment to sell the shares. The record-breaking number of new computer stocks was part of the stock market craze for high technology—about one quarter of the "firm offer" initial public sales of stock over the past year were for computer companies, according to Securities Data.

The average new computer company had $19.5 million in revenues in the 12 months prior to the public offering. It showed $2 million in net income and sold about $21 million in stock. However, there was a wide range of operating histories, because companies that went public earlier in the bull market cycle were older and more established. For example, the largest computer company to go public, TeleVideo Systems, received $113 million from its offering, and had almost $100 million in revenues in the year prior to the March offering. It's been in business for six years.

Newer companies did not have wonderful profits to brag about, only the potential for earnings. Of the 115 companies to go public, less than half had decent profits—52 were solidly in the black, 39 broke even or had small losses, and 29 had substantial losses, according to Securities Data.

Many of the new companies with only red ink on their books took advantage of the seemingly insatiable appetite for new computer company stocks, many market observers say. "After the stock market run-up in prices and premiums, computer company owners couldn't afford not to go public," opines Terence Quinn, an analyst who specializes in emerging growth companies for Dean Witter Reynolds, the brokerage subsidiary of Sears, Roebuck. "In the first six months of the rally, companies with five years of experience went public. Now, the companies going public did not intend to go public this early, but did so just because they can get rich quick."

SKY-HIGH PRICES PAID

Indeed, some of the prices paid by the public are astounding. The average P/E, the traditional measure of value, was 58 for these companies. In other words, the price per share was 58 times the earnings for the preceding year. By comparison, the average multiple for all public companies is about 13, and 15 to 27 for large computer companies like IBM or Wang Laboratories. By another measure of stock price value—the premium paid over the per share tangible assets of the company—the prices were even more outrageous: while most high-tech stock sells for a "book" value multiple of six or less, the average premium for the new computer firms was 30. "The companies offering stock for high multiples are displaying considerable chutzpah," notes Frederic Withington, vice president at Arthur D. Little, Cambridge, Mass.

The $2.4 billion in cash raised by the new companies will find its way into product designs to be introduced over the next few years, further complicating the choices to be made by dp managers. The explosion in microcomputer products on the market, 361 by one recent count, is nothing compared to what some see on the horizon.

The number of new desktop computer design proposals won by Intel and its 16-bit microprocessor chips is mind boggling. Currently there are between 600 and 700 companies buying the two 16-bit cpus, the 8086 and the 8088. "We are shipping several hundred thousand 8088s per month," claims Andy Verhalen, product manager at Intel. Half of the 8086 and 8088 designs, but most of the production volume, is for personal computers, he says. Company officials concede that there are "production shortfalls" of the key chips, but claim production is being stepped up dramatically.

The next generation of 16-bit microchips, the 25% faster 186 and 188, are being designed into new products at the rate of more than one a day, according to Tony Barre, Intel marketing manager. "We already have 400 product designs locked up and we expect to have 1,000 by the end of the year," he says. About half of the designs are for workstations, the other half for intelligent controllers. Convergent Technology's Megaframe controller and n-gen workstation are two of the hundreds ready to appear on the market. Intel says that its production of the new chips will exceed that of the current generation by 1985, indicating that dp managers will have about a year to digest the 8086 and 8088 boxes before the 500 or so of the next generation are introduced.

The odds for the survival of these companies and their products are subject to debate. Rosen insists that "there is room for this type of activity as long as there are no standards in the marketplace." With market demand growing at 30% to 40% per year, he

Software companies often go public in order to build an acquisition war chest.

FIG. 1

TEN LARGEST COMPUTER COMPANIES TO GO PUBLIC IN LAST 12 MONTHS

DATE	NAME OF COMPANY	TOTAL AMT ($MIL)	REVENUE LATEST 12 MOS ($MIL)	NET INCOME ($MIL)	P/E	PREM OVER BOOK	COMPANY DESCRIPTION
3/15/83	**Televideo Systems**	113.	98.5	12.7	50.0	26.44	mfg video display terminals
3/4/83	**Fortune Systems**	110.	26.0	–3.2	—	27.86	mfg/mkt desktop computer
3/3/83	**Apollo Computer**	88.0	18.1	0.3	1,100.0	32.70	mfg/mkt/service computers
4/27/83	**Telerate**	80.0	51.9	14.5	54.1	66.19	oper computer financial syst
3/23/83	**Victor Technologies**	78.8	123.4	–11.3	—	10.85	mfg/mkt microcomputer
6/30/83	**Wicat Systems**	72.0	25.3	–4.1	—	63.05	mfg/mkt microcomputer syst
11/4/82	**Altos Computer** Systems	69.3	57.4	6.4	38.2	16.53	dvlp/mkt microcomputer syst
6/2/83	**Priam**	65.5	51.2	1.2	170.0	18.10	mfg/mkt disk drives
5/27/83	**Norsk Data**	56.6	85.6	7.1	41.9	4.07	mfg/mkt minicomputers
12/10/82	**Quantum**	51.3	29.8	4.1	20.1	10.90	mfg/mkt disk drives

SOURCE: SECURITIES DATA

FIG. 2

TEN MOST EXPENSIVE NEW COMPUTER COMPANY STOCKS

ISSUE DATE	NAME OF CO.	TOTAL AMT. ($MIL)	$PRICE/SHR	NET INC ($MIL)	PRICE/ERNGS
3/3/83	**Apollo Computer**	88.0	22.00	0.3	1,100.0
6/1/83	**Daisy Systems**	31.0	15.50	0.4	221.4
6/3/83	**Micropolis**	40.2	17.00	0.7	170.0
6/2/83	**Priam**	65.5	17.00	1.2	170.0
6/30/83	**Avant-Garde Computing**	30.1	16.00	0.3	123.1
8/26/83	**Stratus Computer**	36.0	12.00	0.9	100.0
3/25/83	**Masstor Systems**	48.0	16.00	1.3	100.0
6/24/83	**Margaux Controls**	24.8	16.50	0.7	97.1
7/12/83	**Micro D**	32.0	16.00	0.8	88.9
7/12/83	**Perfectdata**	9.2	8.50	0.2	77.3

SOURCE: SECURITIES DATA

adds, there will be enough customers for awhile.

Others take a less sanguine view. "In five years 20% of these new companies will be operating in some independent form," estimates Withington of ADL. "Another 20% will have gone bust, and the rest will get a little bigger and then sell out to a bigger company that is trying to diversify." Another venture capitalist estimates that one out of 20 new companies will survive. A study by the SEC after the 1960 to 1961 boom in new companies found that three years later, only 20% remained profitable.

The $64,000 question, of course, is, Which ones will survive? "The marketplace is a quagmire, with an overabundance of new entrants," observes Stephen McClellan, vice president of Salomon Bros., a Wall Street investment banking and stock brokerage firm.

Certain market segments, though, are less crowded. The high-end workstation market, with price tags of $20,000 and up, is an area with relatively few players. Alexander Stein, senior industry analyst at Dataquest Inc., Cupertino, Calif., notes that Apollo, Perq Systems, Charles River, and several other companies in that market category will thrive if they can maintain strong ties with major systems vendors such as Calma, Applicon, and Computervision. "It's a small market, growing 25% to 30% per year from less than $1 billion today," says Stein. "That will level off and stabilize."

A more competitive marketplace, Stein notes, is what he calls the Unix box business. He counts 70 companies making microcomputers using the Motorola 68000 chip or other high-performance micros, and the Unix operating system. Fortune Systems is one of the companies that is fighting for market share, as the sector's annual growth rate has slowed to 25% from 45%. "These companies are starting to feel the competition," he says.

The crush of competition is heaviest in the "IBM emulation" market, with more than 100 personal computers that run Microsoft's MS/DOS or PC/DOS software. "The market is growing at a tremendous rate because of IBM capacity limits," Stein notes. Over the next few years, he warns, IBM's production will expand rapidly and could significantly diminish the market for the P.C. clones. "Remember the early days of the VT100?" Stein asks. "Others came in when DEC had limited production, but after DEC went into volume, they got hurt. The uniqueness of some of the clones will keep them around, but the high growth rate will diminish and those that haven't diversified won't survive."

The shakeout in the portable computer category is already happening. Osborne Computer Corp. is bankrupt. "There are few barriers to entry in the portables business, with a short product cycle," notes Stein. "Osborne fell victim to the life cycle and cash flow perils—it couldn't get enough cash out of its current products, due to price competition, to keep new products coming."

COMPANIES REPORT TROUBLES

Other companies are reporting troubles as well. Victor Technologies, Vector Graphic, and Fortune Systems reported losses over the past few months. Other companies, such as Altos and Convergent Technologies, have warned that earnings over the next few months will be less than in the past, and nowhere near the levels investors expected when they paid the high premiums for the stock. Company officials insist that their firms will be healthy and will survive the inevitable shakeout.

Software companies that were no more than a gleam in someone's eye a few years ago are now part of a massive industry consolidation. New starts like On-Line Software and Hogan Systems are making joint venture agreements or buying other companies to broaden their product lines as fast as possible. "Many small software companies are using the money from the public offerings to buy other companies," notes Quinn of Dean Witter. "Essentially, they are using the stock offering cash to build war chests."

Picking the probable survivors is a tough chore, whether you are an analyst, venture capitalist, market researcher, or dp manager, but several rules of thumb are considered valid. "Any company that we put money into must have an aggressive new product policy," notes Rosen. "A new company typically needs to expand its product line in three to four years," explains Withington of ADL. "Of the 80% of the companies that won't make it, half will sell out due to the lack of an encore, a second big product."

A full line of me-too products is not a recipe for success, though. Proprietary technology is crucial, notes Quinn. McClellan points to Masstor Systems as an example of a company with long-term prospects, owing to its proprietary technology in the relatively uncrowded market for large storage devices.

When a dp manager considers dealing with a new company, a checklist of what to look for should include a close scrutiny of its prospectus. Companies going public without a history of earnings should be avoided. Managers should also look for senior company officials with experience at big companies in a related field, and for big name venture capitalist backers.

The president of that small manufacturing company in Southern California said he was aware of those considerations before he bought the software-deficient office automation system. The vendor had promised to fix the problems with revised software, but the customer is still waiting. That particular vendor, like others, tried to use the public offering cash to cover over its mistakes of the past, alleges Stein. It couldn't.

EASY COME, EASY GO

The Kay family of Solana Beach, Calif., lost a quarter of a billion dollars over the summer. They didn't lose it in a Las Vegas poker marathon, but on Wall Street. In early July they offered to sell shares in their portable computer company, Kaypro, for up to $18 per share; therefore, their holdings of 28 million shares would have been worth $504 million. But after intense negotiations, pension fund managers and other investors refused to pay more than $10 per share. The value of the Kay family stock dropped to a mere $280 million on paper.

Instant riches are still possible on Wall Street, regardless of the losses suffered by Texas Instruments, Mattel, and the Atari division of Warner Communications. The ardor for new computer stocks has made millionaires out of many executives of computer systems firms and their peripheral companies.

Last year a limited partnership led by former Wall Street analyst Benjamin Rosen and Mostek founder L.J. Sevin invested about $2.3 million in Lotus Development Corp., the Cambridge, Mass., company that produced the 1-2-3 integrated software package for the IBM P.C. A few weeks ago the company went public, and the market value of the shares held by the Sevin-Rosen partnership was between $46 million and $53 million, or a 15-fold profit in little more than a year. The liquidation value of the partnership's portion of the company's assets was $1.7 million.

There are scores of overnight millionaire stories. Phil Hwang, founder of terminal and desktop computer maker TeleVideo Systems, owned 29 million shares of his company, each valued at $18, when it went public in March. On paper his holdings were worth $520 million.

Many longtime investment analysts and computer industry observers were shocked at the high per-share prices set for these companies. In many cases, the liquidation value of the company on a per-share basis was less than a dollar per share.

Lotus priced its shares at $13 each when the company's liquidation value was 48 cents per share as of June 30. TeleVideo's tangible book value was 68 cents per share when the price was set at $18. When Kaypro sold 4 million shares of stock at $10 apiece in August, the value of the company at that time was little more than 20 cents per share. In the past, investors were willing to pay a high premium in return for the higher earnings growth and stock market price potential of new high-technology companies. Unfortunately, as many wags note, the offering prices not only discount the future, but the hereafter as well.

The offering price for the stock of new companies is determined in a series of private negotiations between the Wall Street brokerage houses and their customers. The resulting price is a balance between supply and demand, though the relative valuations dropped during the summer after several high-tech stocks lost some of their glitter in the wake of the losses posted by TI, Atari, and others.

"The prices are lower now, because there's less euphoria in the marketplace and a lot of the stocks are selling below the offering price," explains Rosen. The number of deals is slowing down, he adds, because only the quality companies can attract premium prices. "The lower quality deals are in trouble."

One company that recently tried to go public but faltered was Androbot Inc., a manufacturer of several types of consumer robots. In June the company offered to sell stock for up to $12 per share, seeking an infusion of $1.5 million in new working capital. But the offer was withdrawn in September, explains a company official, "due to market considerations." One money manager avers that the company's poor financial health was more of a factor. "I was shocked to see this as a deal," he said, "and further shocked that Merrill Lynch would be associated with it." First-rank brokerage firms like Merrill Lynch usually take only the most successful companies as clients; Merrill Lynch officials declined to comment.

Technically, Androbot was bankrupt when it tried to sell stock. Although it had sold nearly 700 robots earlier this year, the company had less than $400,000 in assets compared to almost $3 million in liabilities as of March 31. Only loans from Nolan Bushnell, the founder of Atari and now the godfather of several Silicon Valley startups, including Androbot, keep the company above water; in fact, the company's San Jose office space lease is personally guaranteed by Bushnell. If Androbot's stock offering had succeeded at $12 per share, Bushnell's holdings would have been worth $37.7 million. He may have a long wait to see that money.

—L.M.

NOTE

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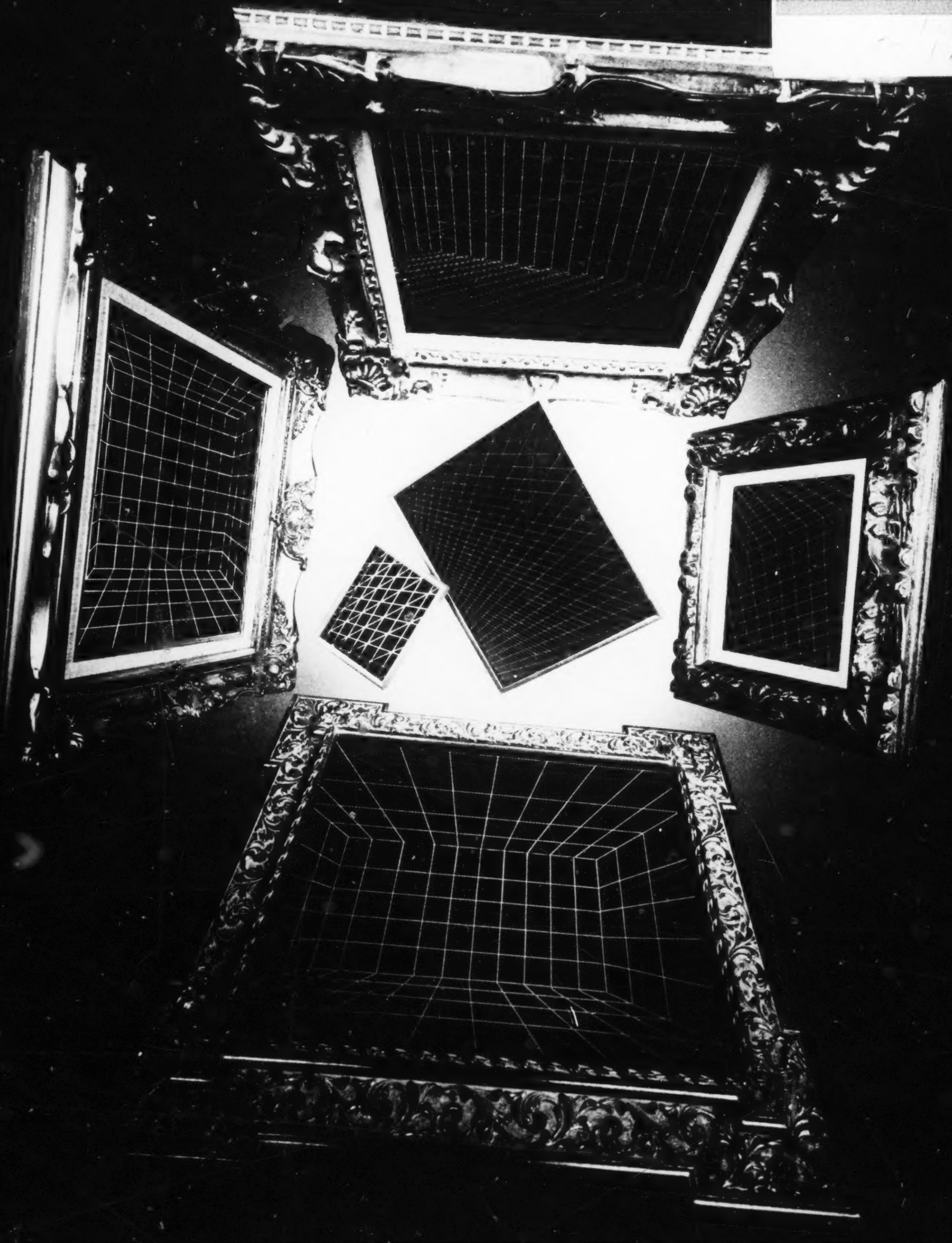

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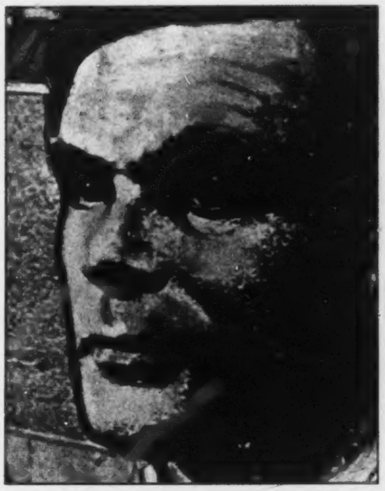

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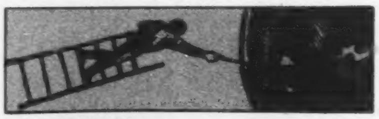

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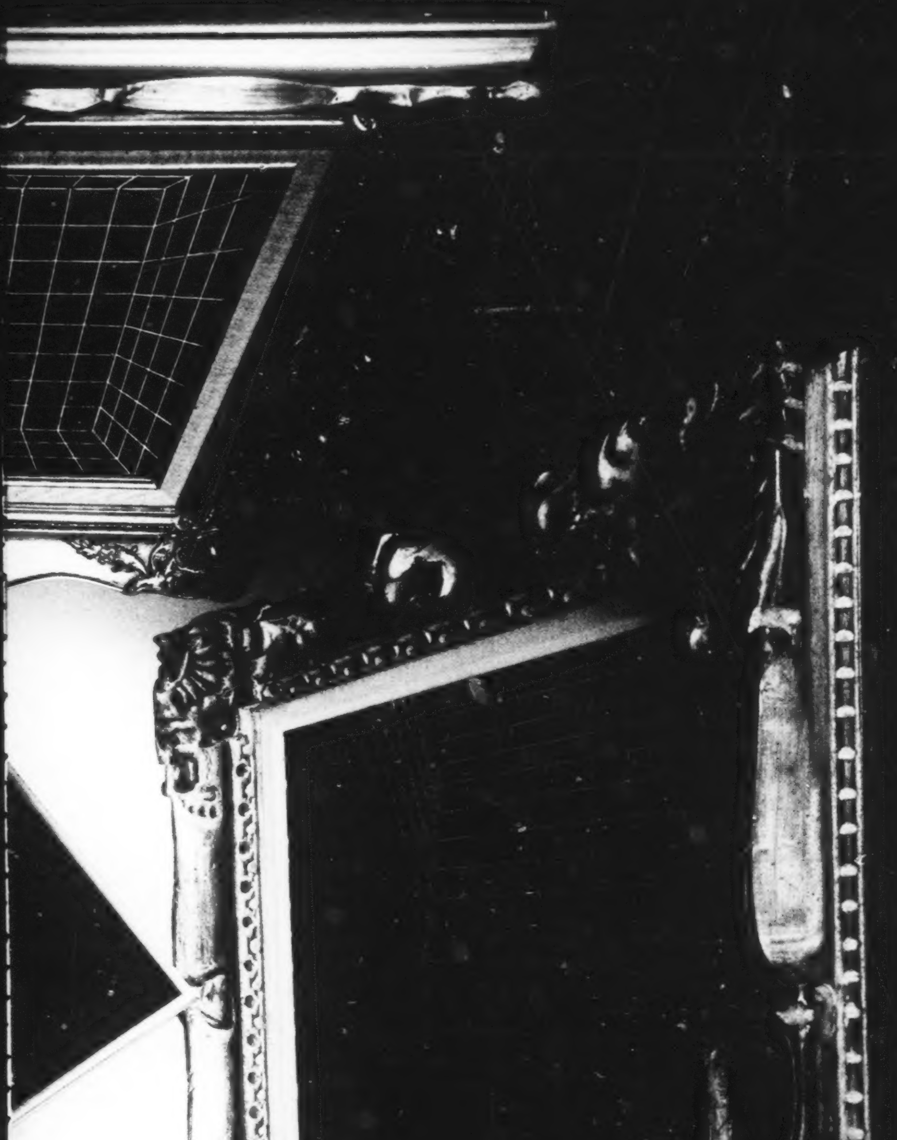


Users who made purchases from the gallery of systems software gave enthusiastic reviews of package performance and support.

SYSTEMS SOFTWARE SURVEY

by Data Decisions

Most systems software vendors are meeting the needs of their users and are maintaining their products with a high degree of technical competence, according to a new survey of systems software users. Group averages, on an ascending scale of 1 to 10, ranged from 6.8 to 7.5 for the six product categories and 5.9 to 6.7 for vendor support; the overall product average was 7.1, and the overall support average score was 6.4. Respondents said about 15% of the currently installed packages would be replaced, for a variety of reasons such as the purchase of new computer hardware or the need to upgrade the system; 79% judged the packages "outstanding."

The ratings are based on a survey taken earlier this year. Software consultants at Data Decisions, of Cherry Hill, N.J., polled thousands of data processing department managers, asking them to rate their systems software. In total, 5,171 users responded, offering their opinions and experiences on the performance of 106 packages and their vendors (see Methodology, p. 116.) Six types of systems software were included in the survey: utilities and OS enhancements, programming aids, monitoring aids, DBMS, query and report writers, and communications.

Users were questioned on the package's performance, day-to-day operational details such as security and vendor support, and to what degree the system's performance matched the claims made by its vendor. Suppliers will be relieved to hear

[illegible] BROSCAN

Support for communications packages received low ratings.

that 90% of the users reported that the packages met or exceeded the promised performance.

The SAS database management package, from SAS Inc., was the highest rated product, with a 9 out of 10. Other best of category packages, and the categories, are: Dylakor's DYL-280, with an 8.4 rating compared to other query and report writers; ADR's Vollie, with an 8.2 rating in the program development aids and utilities category; Westinghouse's WESTI, with a 7.9 for the communications category; Innovation Data Processing's Fast/Dump/Restore utility enhancement package; and Candle's Omegamon, with an 8.8 for the monitoring and performance aid category.

Product performance and vendor support ratings were consistent in all but one case. Communications software presents a paradox—the products rated 6.8 on average, but support lagged at 5.9. Many teleprocessing monitors from independent vendors no longer receive a vote of confidence, while some of the terminal support products are just starting to attract attention. Perhaps the developers of IBM compatible communications monitors have decided to leave the market to IBM and its CICS and retrench into other software product lines.

Throughout the survey, two categories consistently scored high. Utilities and monitoring aids received high ratings, 7.5 and 7.1 respectively, and no wonder. By their very nature, they are simple, straightforward, no-nonsense packages that offer the user quick installation and use. Very little training is required, documentation is usually adequate, and under normal circumstances, enough of these packages have been installed to minimize bugs and errors. Usually no special hardware is needed so the package makes no additional demands. Also, their high ratings can be explained as expected, given their limited and clearly defined capabilities.

SLIGHTLY LOWER SCORES

On the other hand, communications software usually requires special equipment and a highly trained individual to implement the package. The relative complexity of communications software, and the wide range of activities it addresses, would lead one to expect the slightly lower performance figures—group average of 6.6—that these packages received.

The popularity of monitoring and performance aids may be the result of the profusion of large IBM MVS-type systems—users have found it essential to employ control systems to optimize system resources. Monitoring products such as Candle's Omegamon, with over 500 sites, and Morino Associates' TSO/MON, with over 400 sites despite the fact that it runs only on MVS, are becoming household words in the homes of large system operators. These products must be doing the job since they are so popular.

Database management systems (DBMSs) are becoming more comprehensive than anyone had originally expected. They now include data dictionaries, query languages, maintenance and control utilities, and, in many instances, associated applications software. Vendors of these expensive systems have even set up interfaces for transaction processing on a local and/or remote basis.

Much attention has been paid to DBMS technology over the past five years. However, with the arrival of fourth generation languages and interactive development tools, the software-acquisition emphasis has shifted slightly from these large-scale products. The more popular DBMS vendors have responded to this shift and are beginning to provide micro-mainframe DBMS/DMS interfacing products. This approach has already been implemented by ADR and Cullinet. Relational versions of the more popular nonrelational DBMSs will also become more prevalent as the user-friendly (albeit resource intensive) nature of the relational system becomes more accepted.

In this survey data management and database management systems were combined in the same category. There may be some who feel that data management systems are less sophisticated, and in some instances this may be true. The data management systems of today, however, are much more complex than many people think. In fact, it is often difficult to determine where the data management function ends and the database management function begins.

While DBMS vendors are modifying their products to meet changing needs, standalone query and report writer systems are finding it difficult to compete both with DBMSs and with new application development tools now being introduced. Not too many years ago, every sophisticated data processing installation had its favorite query/report writer system, but, as users moved to a centralized processing environment, the capabilities of these products were incorporated into totally integrated systems. Coupled with this, new application development tools encourage people without data processing backgrounds to start programming reports that had previously been done by the dp department. The introduction of the microcomputer, with its spreadsheet packages and other programming tools for the nontechnical user, has all but stolen the glamour from the standalone query/report writer systems. In many cases, vendors have integrated these older products into other packages in their product line and sold them as a unit.

Copy routines, file reconstruction routines, sort programs, and other utilities are the backbone of every reasonably-sized data shop. There are companies that have enjoyed great success marketing only these packages, and as long as we use complex and sophisticated operating systems, they will continue to be in much demand. Their simplicity of function and ease of installation and support result in consistently higher average ratings than for any other categories. In the Data Decisions study, nine products in the utility category attained average mean scores of 8 or higher while only six products received comparable ratings in all the other categories combined.

The replacement operating system market is another story. There are relatively few replacement systems, and these too may well disappear from the scene. Aside from the very real problem of what to do with existing applications, the complexity of the IBM operating system environment makes it financially infeasible for a competitor to try to capture an appreciable market segment.

More action can be seen among products that address disk space management, library control and maintenance, and generalized data manipulation/resource management activities. They will always rate high because their limited operating capabilities are so well delineated that the user doesn't attempt anything beyond the defined scope of the product's design. These products fill today's needs, and, in the foreseeable future, they will probably remain a mainstay of the medium- to large-scale user shop.

The charts that follow indicate how the various kinds of products fared against one another in areas such as performance, vendor maintenance, and operations. User thoughts on the product and the support services overall are also included.

HOW THE PRODUCTS PERFORMED

As for specific ratings, Performance was the first addressed. Users were asked to rate, on an ascending scale of 1 to 10, their product's economy and efficiency in terms of hardware resource utilization, ease of use, freedom from program bugs and errors, and the time required for initial installation. With 1 representing the lowest and 10 the highest score, the average performance composite for all packages was 7.0. However, because the six categories differ significantly in terms of function, sophistication, and complexity, the group averages for individual categories are more significant: utilities and operating systems enhancements had a 7.4 group average; program development aids and programming utilities received a 7.1 rating overall; monitoring and performance aids also scored a

About 30% of the communications software users said they may change vendors.

7.1; database and data management packages rang up a 6.8; query and report writers and DBMS aids, 6.6; and communications software, a 6.6.

The ratings assigned to database management and data management systems are a healthy sign that vendors are providing users with what they need. The high rating for the program development aids/programming utilities category (which includes development languages) indicates that significant performance improvements can be realized from their use.

The Vendor Support section contains responses to questions on the vendors' responsiveness to users' needs, the effectiveness of the training supplied (where training is applicable), and the quality and usability of the documentation. The composite average for all packages was 6.3. The individual group support averages were utilities and operating systems enhancements, 6.5; monitoring and performance aids, 6.4; program development aids and programming utilities, 6.3; database and data management systems, 6.2; query and report writers and DBMS aids, 6.1; and, communications software, 5.8.

Understandably, the degree of support often correlates with the complexity of the product, and this factor is evident in the results. Support for relatively simple products such as utilities is usually judged less harshly than support for more sophisticated, complex, products such as DBMSs and communications software. The operations category dealt with how well the package handled expanding processing volume, backup/recovery, and security. The average composite for all packages was 6.7. The individual group averages were utilities and operating systems enhancements, 7.2; monitoring and performance aids, 6.8; program development aids and programming utilities, 6.8; communications software, 6.4; database and data management systems, 6.4; and, query and report writer and DBMS aids, 6.3.

DBMSs and communications systems software are the major categories where backup/recovery and security are of major concern, and the relatively low ratings achieved by these types of systems should be construed as a warning signal to vendors of transaction-oriented products.

After respondents rated specific characteristics, they were asked to give an overall satisfaction rating on the package itself and on the quality of the vendor's support. They gave the products a rating of 7.1. The rating for support services, however, was only 6.4.

Utilities and operating systems enhancements received a product average of 7.5 and a support average of 6.7. Database and data management packages received a 7.1 for products and a 6.3 for support. Program development aids and programming utilities received a 7.1 for the product and a 6.4 for support. As for monitoring and performance aids, the average was 7.0 for the product and 6.5 for support. Communications software received a 6.8 and a 5.9, and query and report writers and DBMS aids received a 6.8 and a 6.2, respectively.

The survey identified four basic types of support commonly offered by software vendors: on-site support; telephone hot line; on-line support, where the user's computer is remotely hooked into a diagnostic computer at the vendor's support site; and mail. In many cases, the respondents were using more than one form.

The database/data management product from SAS Inc. had the highest rating for vendor support with an 8. It was followed by the query, report writer, and DBMS package of Dylakor, with a 7.9 rating. Runners-up for support were Vollie, from ADR, with a 7.4; Tone 3 from Tone Software, and WESTI, from Westinghouse, tied at 7.2; Fast/Dump/Restore, from Innovation Data Processing, with an 8.5; and TSO/MON, from Morino Associates, with an 8.

A total picture of how each package measured up against the average for its category and for all the products in the survey is provided by the bar graphs at the end of this article.

PHONE RESPONSE POPULAR

The most popular form of quick response support was telephone consulting, used by 90% of the respondents. Because of the high level of diagnostic expertise available at most vendor installations, this makes sense. More surprising, perhaps, is the fact that over half the respondents, 54%, still use the mails, and that their rating of this support is still relatively high, 6.1.

Another figure that could be considered surprising is the 41% response showing the use of on-site support. It is not uncommon for a vendor to assign someone from a nearby support office to attend to a large customer's needs, and vendors are trying to expand their sales and support capabilities so they can be within easy reach of any major account. Although on-site support is very expensive, users are obviously taking advantage of the proximity of available assistance. Clearly many users are willing to pay big money to deal with one person who knows the staff, the idiosyncracies of the systems, and the ins and outs of the applications it is running. And the average rating of 6.5 shows that the level of satisfaction is relatively high.

On the other hand, on-line support, a technique that several vendors (including IBM) attempted to sell to large system users, has never become particularly popular. The number of users employing it is low, only 14%. Even more important, the average rating of 5 shows that performance in this area is only "acceptable," while all other types of support were rated "very good." Some of the reasons could include the cost of establishing the original hookup, or the interface may be too complex. The lack of human interface might pose psychological problems for the customer. How many times have you hung up the phone when a machine asks you to start talking when you hear the beep?

Needless to say, certain types of software lend themselves more to one type of support than to another. As one might expect, users of the more complex software products, such as DBMSs and communications systems, were significantly more likely to use on-site support than were users of other types of products—55% versus an average of 41%.

In addition, DBMS users utilize on-line problem diagnosis at a rate of 26%—almost double that for any other type of user. The two categories with support services rated higher than the others—utilities, monitoring, and performance aids—are also the two with the lowest percentage of users utilizing on-site support.

Smart managers are always looking for products that deliver value for the dollars they spend. To determine whether our systems software users felt they had realized this goal, Data Decisions asked them to characterize the value of their packages. Overall, 49% of the users of the average package felt they had received excellent value for their investment; 35% said their package offered outstanding features, while 14% reported that the package provided good features at a low price. Respondents who felt they had acquired good value made up 43% of the response. This includes 8% who felt they had packages with outstanding features, but at a high price; 32% who said they had acquired good features at a comparable price; and 3% who reported that their acquisitions lacked features but were priced low enough to make them worthwhile. Only 4% thought their packages were poor values. This total was split equally among those who felt they had installed packages with good features, but at a very high price, and those who had installed systems that lacked necessary features and were overpriced as well.

Thus, over 90% of the respondents regarded their packages as excellent or good value for the money, and over 80% said their acquisitions contained good or outstanding features at comparable or low prices. Competition among software suppliers has had much to do with these results, but we shouldn't overlook the more educated selection processes being incorporated in many installa-

Previous experience with the same vendor doesn't count for much.

tions. This combination of competition and increasingly sophisticated buyers should keep these vendors on their toes and ensure that they continue to deliver the types of products up-to-date users demand at a price that is fair and equitable.

Every data processing manager has been involved in a software package selection process. During this exercise, much time is spent listening to salespeople describe what the company needs and how the package will meet those needs. Sometimes, however, after the sale has been made, the salesperson has to rush back to the development site and prod the resident genius into figuring out how to modify the product to meet the claims. If the customer is lucky, the modifications are made with little or no effect on the installation. In some instances, however, the modifications are never done, or they have an undesirable effect on the performance of the package. To help clarify this problem, respondents were asked to judge whether three areas of package performance exceeded, met, or failed to meet vendor promises. The response was overwhelmingly positive. Installation time exceeded promises in 9% of the cases; met promises, 81%; and did not meet promises, 6%. As for features and capabilities, the packages exceeded promises 9%, delivered 83% of the time, and failed 5%. In performance, speed, and efficiency, the rates were 8%, 81%, and 7%, respectively.

PACKAGES FULFILLED PROMISES

With over 90% reporting that their packages either met or exceeded the performance promised by the vendor, the chance of a major mismatch based on promised capability seems far less likely today than it was in previous years.

Although the responses from users of all six types of packages closely followed the percentages reported for the overall survey, some interesting deviations occurred. For example, the percentage of respondents who said their products did not meet promises in terms of performance was higher in the database/data management group than in any other (12%), and users of query/report writer/DBMS aids felt almost the same way (10%). Ten percent of the communications software users responding to this question reported that their acquisitions did not meet vendor promises when it came to installation time. Again, we see that the more complex software entities carry with them high expectations but less-than-expected results.

To determine how much influence various factors have on the selection process, users were asked about seven points of consideration likely to come into play during the selection process. Then they were asked questions that explored pre- and postacquisition procedures. Finally, users explained why they were thinking of replacing their packages.

The capability and features of the package were cited as the major influence by 81% of those polled, with 10% considering features a minor influence and 3% responding with no influence. Productivity and ease of use were cited as a major influence by 66%, with 22% saying "minor influence" and 6% saying "no influence." Compatibility was a major influence for 60%, a minor influence for 20%, and of no influence for 14%. Vendor presence and reputation is less of a factor than everyone assumes—37% say it is a major influence, 41% say it is a minor influence, and 16% say it has no influence. The costs and implementation time is a major consideration for 30%, a minor influence for 41%, and of no influence for 22%. Prior experience with the vendor is a major influence for 20%, a minor influence for 18%, and of no influence to the majority, 55%. The least important influence is advice from others—13% say a recommendation is a major influence, 18% say it is likely to be a minor influence, and 62% say a good word from a third party is of no influence.

It seems likely that a good experience with a vendor with whom one has had previous dealings would carry more weight than the 55% "no influence" rating, but today's better informed users don't seem to let past experiences influence current selection processes. This means that vendors continually have to prove themselves and their products.

Although most of the percentages within the six groups followed patterns similar to those shown in the overall breakdown, there were some interesting deviations. In the monitoring and performance group, 88% of those answering the question felt that specific features and capabilities were of the utmost importance. This was a solid 7% greater than the average and may indicate that, when selecting this type of package, the user has well-defined expectations concerning improvement and is looking for features that will deliver these capabilities.

A rousing 22% of the respondents rating database/data management packages indicated that software compatibility had no influence on their selection. This is not too strange, when one considers that installing a DBMS normally implies that new applications would have to be written to accommodate it.

Finally, 73% of the respondents rating program development aids indicated that productivity and ease of use were the major influences governing their decision. This high percentage was balanced by a low of 56% in the monitor and performance aids group who felt that ease of use was of major importance. The very nature of the user-friendly software promised by most developers of these tools probably accounts for the 7% above average figure, while the users of fine-tuning tools expect specialists to interpret the results and are not necessarily looking for ease of use. Also, monitors and performance aids are not directly involved in productivity, only indirectly as a result of the analyses performed by them.

61% SAW OTHER PACKAGES

How many of us go out and buy the first item we see? Not many. Fortunately, the same holds true for most installations in the market for software products. Users were asked whether they had evaluated alternative packages, from either the computer manufacturer or independent software vendors, before acquiring the package being rated, and to indicate the number of prior reviews in both cases. It turned out that 61% had evaluated alternative packages; 33% had evaluated an average of 1.6 packages from computer manufacturers; and 50% had evaluated an average of 2.5 packages from independents.

Historically, independent software suppliers have provided more efficient, less expensive, and generally more effective alternatives to the manufacturers' products. The poll indicates that this is still true. It appears that, in the communications software area, computer manufacturers are actively competing with the independents—44% of the users checked out vendor alternatives. On the other hand, independent utilities and report writers seem to be clear favorites, with 50% and 58% of the users evaluating their alternatives—a trend that has been observed for many years. The monitoring and performance aids marketplace has been dominated historically by independent software suppliers such as Boole & Babbage, Morino Associates, and, more recently, by companies such as Candle, so there is less evaluation of alternatives in this area—only 52% of the users—than in any other. This is undoubtedly because the technology is relatively new, and there are relatively few independent vendors.

The growth of software technology is so dynamic that one must continually compare packages being used against those that have become available since their acquisition. As for postacquisition evaluation, it turned out that 22% had evaluated alternative packages after acquisition; 9% had evaluated an average of 1.3 packages from manufacturers; and 14% an average of 2.1 packages from independents. Thus, almost a quarter of the respondents are involved in some form of postacquisition review, and they seem to be looking more toward the independents than to manufacturers for possible replacements. Of course the reason for this might be that most

The overwhelming majority—91%—of packages are still supported by the original vendor.

users bought the manufacturer's package originally, and therefore have to seek an alternate elsewhere.

When asked whether they are thinking of replacing their packages, 15% said yes, with 5% citing the need for features not available in the current package. Four percent indicated that they were upgrading or changing to a new computer system, 2% claimed that execution speed was too slow, 2% claimed that the package was generally unsatisfactory, and 1% claimed that it would cost too much to upgrade or expand the current package.

Why this general lack of activity? For one thing, software packages for mainframes and many minis can be a big investment, even for a large dp installation. When a user spends over $100,000 for a database management system and many thousands more on implementation, application development, and other tasks, there is going to be great hesitance about replacing it. This might be one reason why relatively few are considering replacement, though many users are examining their options.

Another reason might be that, in many cases, the increasing speed of hardware compensates for certain throughput concerns that might have existed earlier. Finally, the low percentage of respondents considering replacement for generally unsatisfactory performance could be interpreted as a plus for the science of initial package selection. Don't forget, however, that the longer a package is installed in a production environment, the more dependent the operations become on that package since changing systems or operating system environments can involve great effort and cost.

A significant statistic reflected in the individual bar charts is that 30% of the communications software respondents indicated that they were considering changing their packages. This figure exceeds that for any of the other groups, where the figures ranged from a low of 10% for program development aids to a high of 17% for database management packages. A possible reason could be the dynamic nature of protocol and office automation communications advancements, which necessitate constant review of existing communications hardware and software.

In light of recent mergers, acquisitions, takeovers, and general realignment of the vendor/developer marketplace, is the original vendor still supporting the package, or is it being supported by a third party or by the user's in-house staff? The overall survey response showed that the overwhelming majority—91%—of the packages are supported by the original vendor, with only 4% supported by a third party and 3% by the in-house staff.

The bar charts show the response to questions on overall satisfaction, installation and initial use, vendor service and support, and operations criteria. Graphs are presented for all 106 packages that were sampled.

The overall satisfaction-product bar encompasses factors such as satisfaction with package features, capabilities, and utility and the frequency of failures requiring extra effort for recovery. Overall satisfaction-support services reflects the user's appraisal of installation, documentation, modification, and training support.

The bar labeled performance reflects economy/efficiency factors such as hardware resource utilization, ease of use, freedom from bugs/errors, and time required for the initial installation. The bar labeled vendor support gauges the vendor's responsiveness to user needs, effectiveness of training, and quality of documentation. The operations bar is a measure of the package's ability to handle expanding processing volumes, backup/recovery, and security.

Note: In split-bar presentations, the solid bar indicates package scores and the open bar the common group average.

Ratings Summaries

DATABASE/DATA MANAGEMENT PACKAGES—23 packages studied.

Mean Score

9.0—SAS Inc. SAS
8.0—Software House System 1022
7.9—Burroughs Corp. DMS-II
7.8—Hewlett-Packard Image
7.7—Cullinet IDMS, Information Builders Focus, Software AG ADABAS
7.1—Group Average, ADR Datacom/DB, Cincom Total, Mathematica RAMIS II
7.0—Henco INFO, Honeywell DM-IV
6.9—Infodata Inquire
6.8—Sperry DMS-1100, Tominy Data Base Plus
6.7—National Information Systems DPL
6.6—Oceanic Systems Extracto
6.5—IBM IMS/DB, Intel System 2000
6.4—Advanced Data Management DRS
6.1—Applications Software Inc. ASI-ST, IBM SQL/DS
5.7—IBM DL/1 DOS/VS

QUERY/REPORT WRITERS/DBMS AIDS—13 packages studied.

Mean Score

8.4—Dylakor DYL-280
7.9—Dylakor DYL-260
7.2—Cullinet EDP Auditor/Culprit
7.1—Manager Systems Products (MSP) Datamanager, Pansophic Easytrieve
6.9—H&M Systems Keyfast
6.8—Group Average, Computer Associates CA-EARL, University Computing UCC TEN
6.6—TSI Int'l. Key/Master
6.5—ADR Datadictionary
6.1—TSI Int'l. Data Analyzer
5.7—TSI Int'l. Data Catalogue 2
5.4—Informatics General Inquiry/IV

PROGRAM DEVELOPMENT AIDS/ PROGRAMMING UTILITIES—13 packages studied.

Mean Score

8.2—ADR Vollie
8.0—On-Line Software Int'l. Intertest
7.8—Altergo Quota II
7.5—Cincom Mantis, IMSL Inc. IMSL Libraries
7.4—Pansophic O-W-L, Software AG Natural
7.1—Group Average
7.0—Oxford Software UFO
6.8—Altergo CPG
6.4—ADR METACOBOL
6.3—Informatics General Mark IV
5.4—ADR Autoflow II

COMMUNICATIONS SOFTWARE—13 packages studied.

Mean Score

7.9—Westinghouse WESTI
7.6—Tone Software Tone 3
7.5—Altergo Shadow II
7.4—ADR Roscoe
7.3—Burroughs NDL
6.9—IBM CICS/VS
6.8—Group Average, IBM IMS/DC, Software AG COM-PLETE
6.7—Cincom Environ/1
6.6—IBM ICCF
6.2—Polygon Systems Intercomm
5.9—ADR Datacom/DC
4.8—TSI Int'l. Task/Master

UTILITIES/OPERATING SYSTEMS/ ENHANCEMENTS—34 packages.

Mean Score

8.9—Innovation D.P. Fast/Dump/Restore
8.7—Corodale System/Manager
8.6—Macro 4 Logout/Multilog
8.5—Syncsort Inc. SYNCSORT, Westinghouse Disk Utilities
8.4—Cambridge Systems Group ACF2, Software Pursuits DOS/MVT/VSE
8.2—Computer Associates CA-Sort
8.1—Software Module Marketing—DMS/OS
7.9—CGA/Allen Super-MSI, Computer Associates CA-RAPS, Compuware Abend-Aid
7.7—Informatics General Shrink, University Computing UCC One
7.6—ADR the Librarian
7.5—Group Average, Computer Associates CA-DYNAM/T, Minicomputer Systems MICOS, SDI EPAT, University Computing UCC Seven

The packages in this year's survey were installed, on average, for 39 months.

7.4—Cambridge Systems Group ASM2, Computer Associates CA-DYNAM/D, Johnson Systems OS/DOS/JARS, Pansophic Panvalet, University Computing UCC Eleven
7.1—Tower Systems D/Fast
7.0—Computer Associates CA-TLMS
6.9—SDI Grasp, Tower Systems T/Fast
6.8—Johnson Systems UMAX
6.7—Nixdorf EDOS, Pace KOMAND
6.3—Computer Associates GA-Jasper, University Computing UCC Two
5.5—Computer Associates CA-Scheduler

MONITORING AND PERFORMANCE AIDS—10 packages studied.

Mean Score

8.8—Candle Omegamon
7.8—Morino Assoc. TSO/MON
7.3—ADR Look
7.2—BGS Systems Best/1
7.1—BGS Systems Capture/MVS
7.0—Group Average
6.9—Boole & Babbage Control/IMS/Realtime
6.7—Boole & Babbage TSA/PPE
6.5—Boole & Babbage CMF/Monitor, Resolve-Resolve/CICS
5.1—Value Computing Comput-A-Charge

METHODOLOGY

The survey, designed by Data Decisions, was conducted in July 1983. Packages from independent vendors were selected using the Million Dollar list from International Computer Programs, Indianapolis, as a source. Only vendors with packages identified by ICP as having grossed $5 million or more in sales were included. Packages from hardware manufacturers were included if at least 30 user sites were recorded on a database supplied by Computer Intelligence Corp., La Jolla, Calif.

Where possible, user site samplings were obtained directly from the vendor. A special delivery letter was sent to each company asking for a list of the 125 most recent customers who had had the designated package installed and running for at least six months as of June 1, 1983. If a package didn't have that many qualified users, the company was asked to supply its complete customer file. Companies were also asked to certify that the list provided actually represented their most recent customers and that they would make no attempt to contact those customers with regard to the survey. (Respondents were also asked whether they were contacted by the vendors.) A minimum of two follow-up telephone calls were made to each company to encourage it to participate. If a vendor failed to provide a site list, Data Decisions contacted the sites registered on the CI list.

The Mailing

In total, 9,961 questionnaires were sent to identified users of 108 packages during the last week of July 1983. As an incentive to respond, a $1 bill was included.

About 57%, or 5,667, of the questionnaires were returned; 105 questionnaires were undelivered by the post office. To ensure a minimum response rate of 40% and a minimum user base of 15 interviews for each package, Data Decisions conducted telephone interviews among those who didn't respond. The questionnaire used was identical, and 88 telephone interviews were completed. This brought the number of survey responses to 5,755, for an overall response rate of 58%. Seventy-four additional interviews conducted on two products resulted in less than 15 user responses per product, and these products were dropped from the survey and eliminated from the overall package totals. This brought the total response to 5,681 completed questionnaires on 106 packages.

The Questionnaire

A questionnaire was mailed to the key vendor contact at each installation, usually the data processing manager or head of the dp operation for the company. The questionnaire first qualified the respondent as a bona fide user and then explored the factors that resulted in the ratings.

Types of Packages Surveyed

This year, the packages were installed, on average, for 39 months, with a low of 31 months for monitoring and performance aids and a high of 54 months for communications software. The overwhelming majority of the packages were running on IBM machines.

Eighty percent of the respondents stated that the principal system for the package was installed on IBM. Amdahl and DEC accounted for an additional 3% each; NAS and Burroughs accounted for 2% each; and Magnuson, Sperry, Hewlett-Packard, Honeywell, Data General, Control Data, and IPL Systems each registered 1%. Adding together all the IBM-compatible systems—Amdahl, NAS, Magnuson, and IPL Systems—reveals that approximately 87% of the 106 packages in the survey run on IBM-class systems.

The packages included in this year's survey have been divided into six categories on the basis of their functions: Database/Data Management Packages, Query/Report Writers/DBMS, Program Development Aids/Programming Utilities, Communications Software, Utilities/Operating Systems/Enhancements, and Monitoring and Performance Aids. Users were asked to rate them on various capabilities, using a scale of 1 to 10, with 9 to 10 for superior, 6 to 8 for very good, 3 to 5 for acceptable, and 1 to 2 for inadequate. Entries are arranged in descending order by mean score. Although these figures give a good general indication of the relative popularity of the various packages, minute gradations should not be taken too literally. Without further investigation one would be hard put to say that a package with a score of 7.0 was definitely better than one with a score of 6.8. If the original vendor is not the current vendor of the package, the original vendor's name is shown in parentheses after the name of the current vendor.

AV. TOLERANCES FOR 68% CONFIDENCE LEVEL

	OVERALL SATISFACTION			SPECIFIC ATTRIBUTE RATINGS		
SAMPLE SIZE	6.0 or Under	7.0	8.0 or Over	6.0 or Under	7.0	8.0 or Over
60 or more	.25	.20	.15	.30	.25	.20
40 to 59	.30	.25	.20	.35	.30	.25
30 to 39	.35	.30	.25	.40	.35	.30
Under 30	.45	.30	.25	.50	.45	.35

The chances are approximately two in three that a reported rating differs by no more than the indicated tolerance from the rating that would have been obtained had all eligible sites been surveyed. For example, suppose a sample of 38 sites gives a software package rating of 7.0 for Overall Satisfaction. The table indicates a tolerance of .30 on this estimate. Thus, the chances are two in three that the interval 6.70 to 7.30 includes the rating that would have been obtained had all eligible sites been surveyed.

Ratings Values

10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

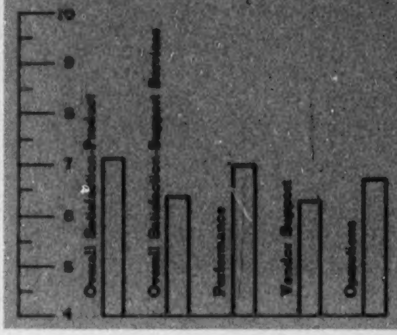
Legend

■ Specific Product Rating
▭ Group Average Rating

■ OVERALL SUMMARY

Average—All Packages • 106 packages

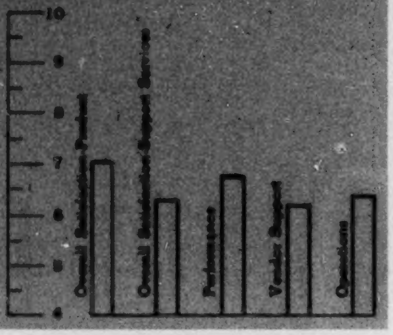
5,171 responses • 79% judged package and 66% judged vendor outstanding • 15% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



□ DATABASE/DATA MANAGEMENT PACKAGES

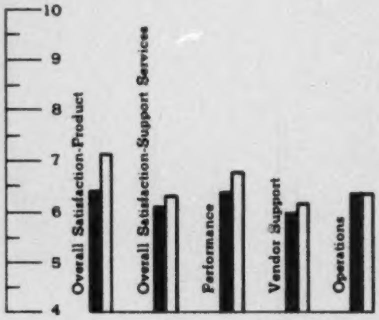
Group Average • 23 packages

1,088 responses • 77% judged package and 64% judged vendor outstanding • 17% actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



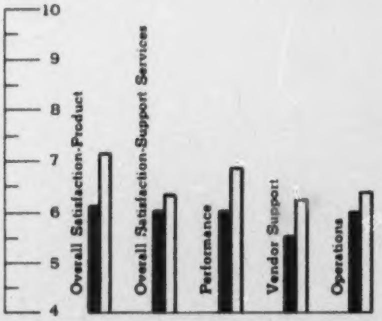
DRS • Advanced Data Management, 15-17 Main Street, Kingston, NJ 08528 • 609-799-4600

39 responses • 67% judged package and 49% judged vendor outstanding • 21% actively seeking to replace package, with 8% citing unsatisfactory performance as reason.



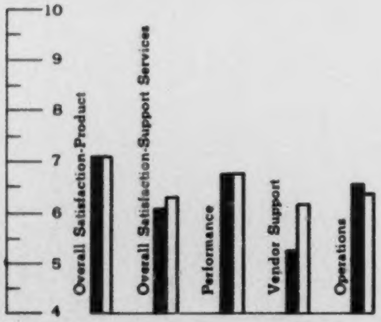
ASI-ST • Applications Software, Inc., 21515 Hawthorne Bldv., Torrance, CA 90503 • 213-540-0111

16 responses • 63% judged package and 69% judged vendor outstanding • 25% actively seeking to replace package, with 12% citing unsatisfactory performance as reason.



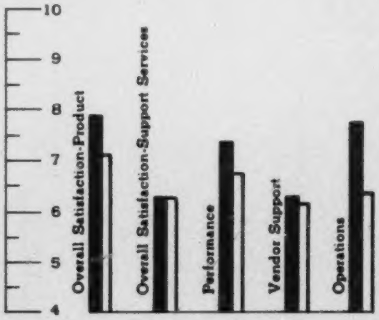
ADR/DATACOM/DB • Applied Data Research, Rt. 206 & Orchard Road, CN 8, Princeton, NJ 08540 • 201-874-9100

83 responses • 79% judged package and 59% judged vendor outstanding • 17% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



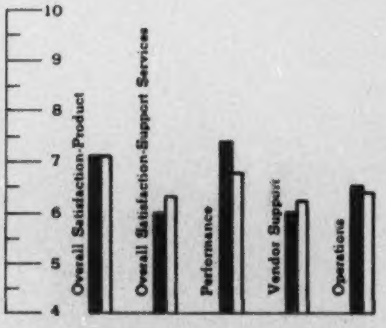
DMS-II • Burroughs Corporation, Burroughs Place, Detroit, MI 48232 • 313-972-9127

54 responses • 89% judged package and 59% judged vendor outstanding • 9% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



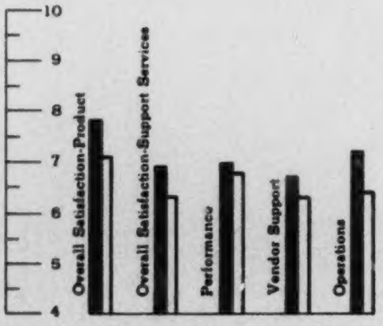
TOTAL • Cincom Systems, Inc., 2300 Montana Avenue, Cincinnati, OH 45211 • 513-662-2300

83 responses • 79% judged package and 58% judged vendor outstanding • 38% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



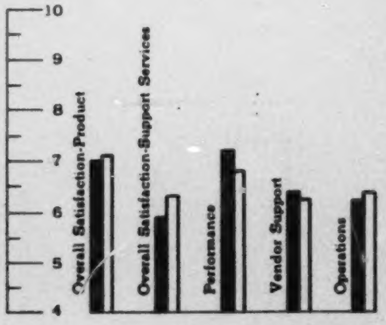
IDMS • Cullinet, 400 Blue Hill Drive, Westwood, MA 02090 • 617-329-7700

61 responses • 90% judged package and 79% judged vendor outstanding • 2% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



INFO • Henco, 100 Fifth Avenue, Waltham, MA 02154 • 617-890-8670

80 responses • 82% judged package and 60% judged vendor outstanding • 12% actively seeking to replace package, with 6% citing unsatisfactory performance as reason.



Ratings Values

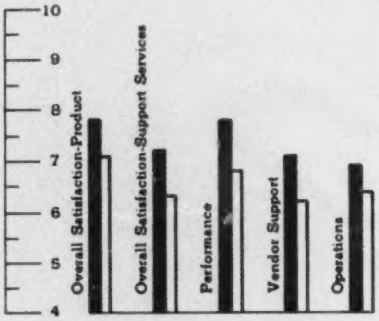
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

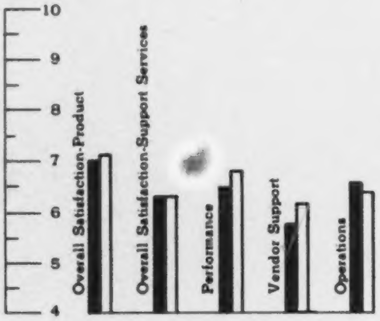
IMAGE • Hewlett-Packard Co., General Systems Division, 978 E. Arquet Avenue, Sunnyvale, CA 94086 • 408-735-1550

89 responses • 86% judged package and 76% judged vendor outstanding • 5% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



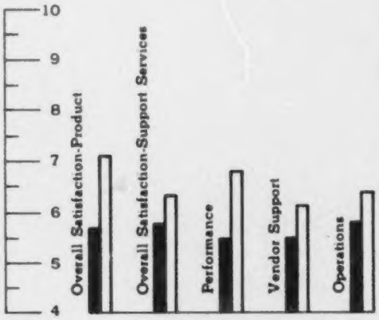
DM-IV • Honeywell Information Systems, Inc., 200 Smith Street, Waltham, MA 02154 • 617-890-8400

29 responses • 72% judged package and 59% judged vendor outstanding • 24% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



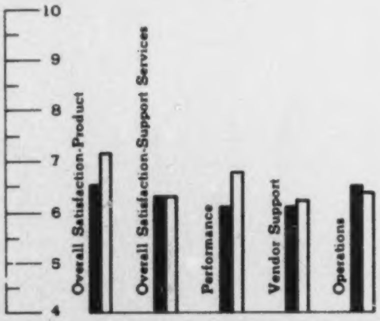
DL/1 DOS/VS • IBM, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

48 responses • 56% judged package and 58% judged vendor outstanding • 27% actively seeking to replace package, with 10% citing unsatisfactory performance as reason.



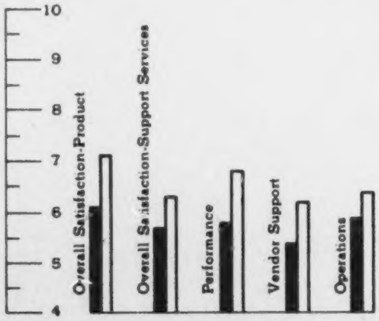
IMS/DB • IBM, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

35 responses • 66% judged package and 54% judged vendor outstanding • 11% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



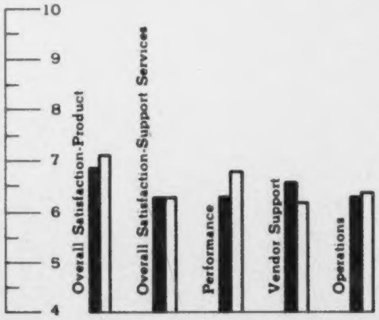
SQL/DS • IBM, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

37 responses • 64% judged package and 60% judged vendor outstanding • 16% actively seeking to replace package, with 8% citing unsatisfactory performance as reason.



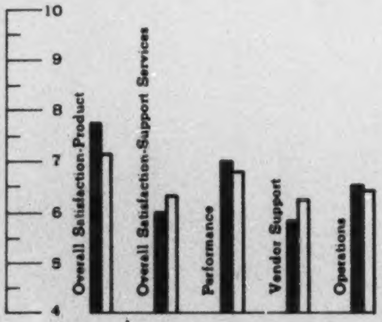
INQUIRE • Infodata Systems, Inc., 5205 Leesburg Pike, Falls Church, VA 22041 • 703-578-3430

57 responses • 75% judged package and 67% judged vendor outstanding • 10% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



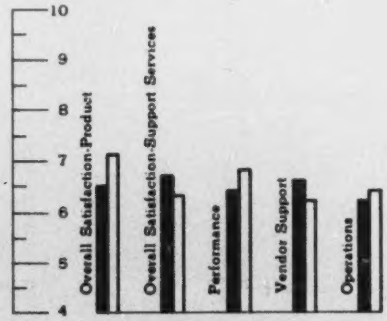
FOCUS • Information Builders, Inc., 1250 Broadway, New York, NY 10001 • 212-736-4433

58 responses • 90% judged package and 57% judged vendor outstanding • 9% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



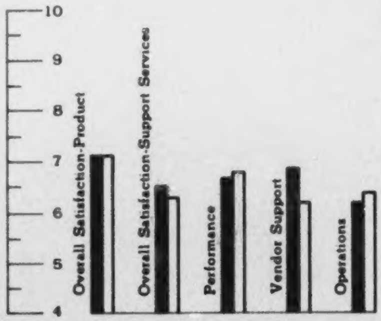
SYSTEM 2000 • Intel Corporation, 12675 Research Blvd. P.O. Box 9968, Austin, TX 73766 • 512-258-5171

51 responses • 69% judged package and 74% judged vendor outstanding • 18% actively seeking to replace package, with 6% citing unsatisfactory performance as reason.



RAMIS II • Mathematica Products Group, Inc., P.O. Box 2392, Princeton, NJ 08540 • 609-799-2600

59 responses • 83% judged package and 76% judged vendor outstanding • 8% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



Ratings Values

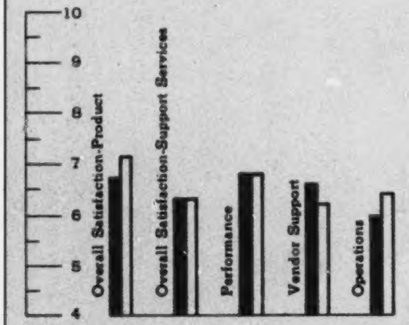
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

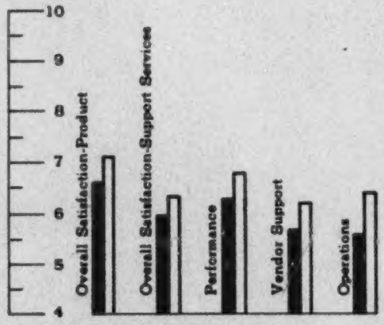
DPL • National Information Systems, Inc., 20370 Town Center Lane, Suite 130, Cupertino, CA 95014 • 408-257-7770

41 responses • 71% judged package and 51% judged vendor outstanding • 46% actively seeking to replace package, with 5% citing unsatisfactory performance as reason.



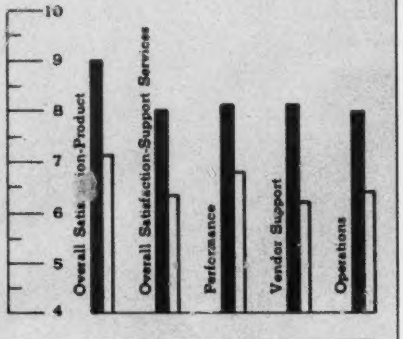
EXTRACTO • Oceanic Information Systems, Inc., 2197 Leon-Harmel, Quebec City, Quebec, Canada G1N 4N5 • 418-681-7741

23 responses • 57% judged package and 57% judged vendor outstanding • 35% actively seeking to replace package, with 9% citing unsatisfactory performance as reason.



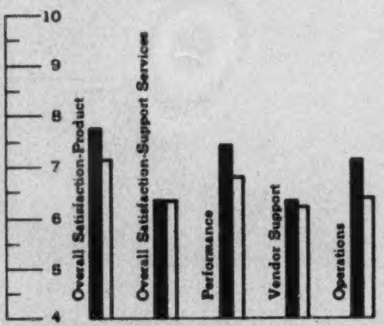
SAS • SAS Institute, Inc., SAS Circle, P.O. Box 8000, Cary, NC 27511-8000 • 919-467-8000

78 responses • 96% judged package and 88% judged vendor outstanding • 1% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



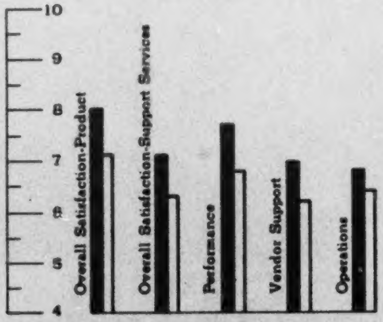
ADABAS • Software AG of North America, International Center, 11800 Sunrise Valley Drive, Suite 1517, Reston, VA 22091 • 703-860-5050

68 responses • 91% judged package and 63% judged vendor outstanding • 2% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



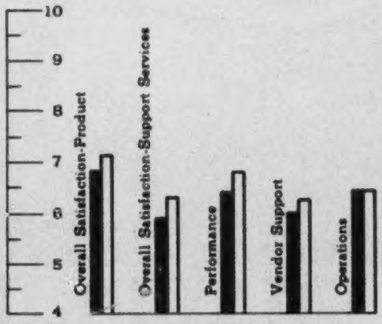
SYSTEM 1022 • Software House, 1105 Massachusetts Avenue, Cambridge, MA 02138 • 617-661-9440

61 responses • 93% judged package and 80% judged vendor outstanding • 15% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



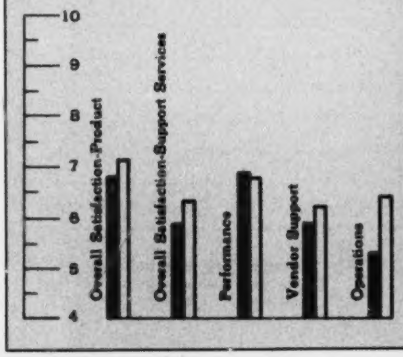
DMS-1100 • Sperry Corporation, P.O. Box 500, Blue Bell, PA 19422 • 215-542-4011

48 responses • 76% judged package and 56% judged vendor outstanding • 9% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



DATA BASE PLUS • Tominy, Inc., 4221 Malsbary Road, Building One, Cincinnati, OH 45242 • 513-984-6605

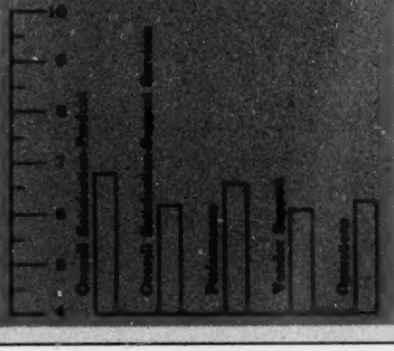
29 responses • 72% judged package and 59% judged vendor outstanding • 28% actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



□ QUERY/REPORT WRITERS/ DBMS AIDS

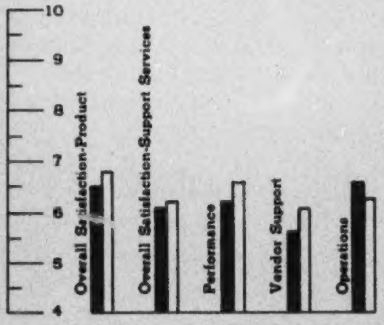
Group Average • 13 packages

678 responses • 73% judged package and 61% judged vendor outstanding • 13% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



DATA DICTIONARY • Applied Data Research, Rt. 206 & Orchard Road, CN8, Princeton, NJ 08540 • 201-874-9100

49 responses • 67% judged package and 57% judged vendor outstanding • 8% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



Ratings Values

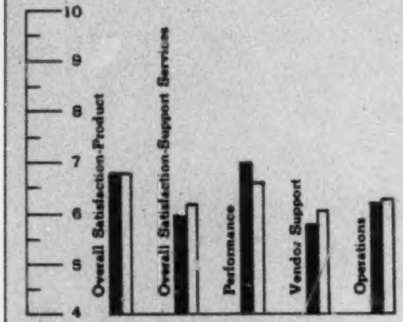
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

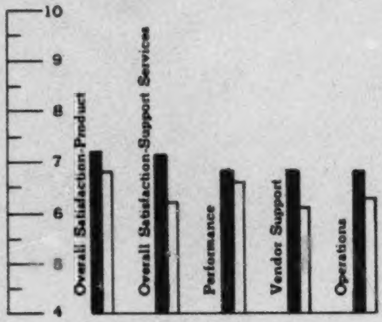
CA-EARL • Computer Associates International, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6733

53 responses • 79% judged package and 58% judged vendor outstanding • 19% actively seeking to replace package, with 6% citing unsatisfactory performance as reason.



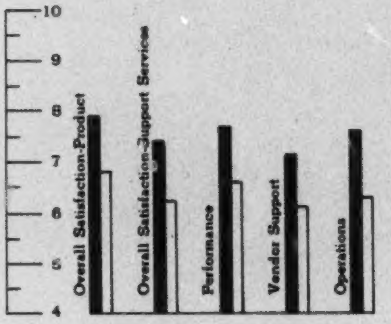
EDP AUDITOR/CULPRIT • Cullinet, 400 Blue Hill Drive, Westwood, MA, 02090 • 617-329-7700

84 responses • 79% judged package and 79% judged vendor outstanding • 4% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



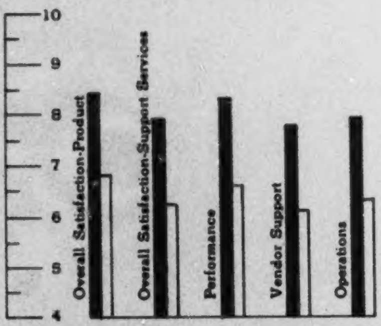
DYL-260 • Dylakor, 17418 Chatsworth Street, P.O. Box 3010, Granada Hills, CA 91344 • 213-366-1781

88 responses • 85% judged package and 80% judged vendor outstanding • 9% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



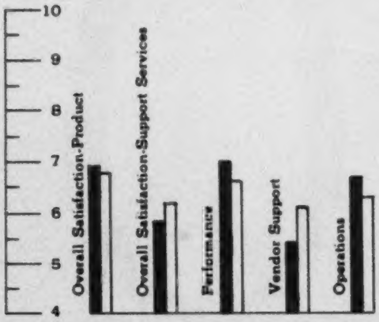
DYL-280 • Dylakor, 17418 Chatsworth Street, P.O. Box 3010, Granada Hills, CA 91344 • 213-366-1781

89 responses • 94% judged package and 90% judged vendor outstanding • 1% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



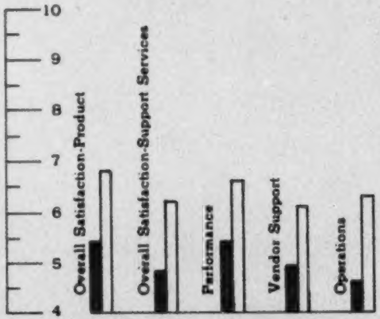
KEYFAST • H&M Systems Software, Inc., 351 Evelyn Street, Paramus, NJ 07652 • 201-599-9111

71 responses • 79% judged package and 51% judged vendor outstanding • 6% actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



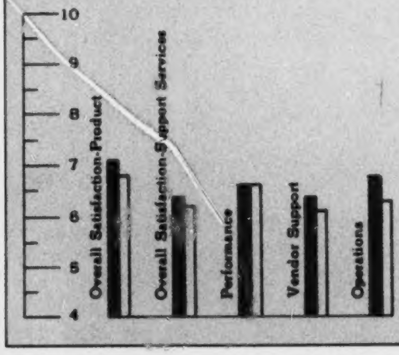
INQUIRY/IV • Informatics General Corp., 9441 LBJ Freeway, Dallas, TX 75243 • 214-231-1400

33 responses • 36% judged package and 24% judged vendor outstanding • 21% actively seeking to replace package, with 9% citing unsatisfactory performance as reason.



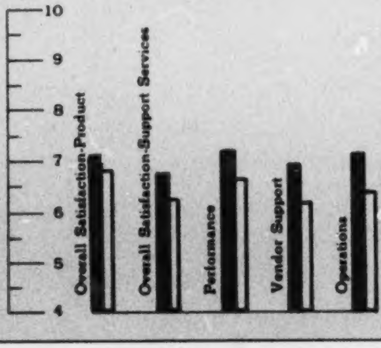
DATA MANAGER • MSP, Inc., 131 Hartwell Avenue, Lexington, MA 02173 • 617-861-6130

63 responses • 84% judged package and 72% judged vendor outstanding • 6% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



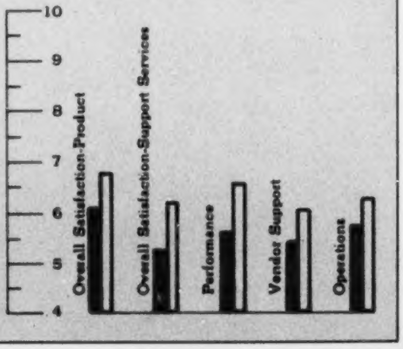
EASYTRIEVE • Pansophic Systems, Inc., 709 Enterprise Drive, Oak Brook, IL 60521 • 312-986-2263

60 responses • 78% judged package and 76% judged vendor outstanding • 10% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



DATA ANALYZER • TSI International, 187 Danbury Road, Wilton, CT 06987 • 203-853-2884

53 responses • 57% judged package and 51% judged vendor outstanding • 26% actively seeking to replace package, with 6% citing unsatisfactory performance as reason.



Ratings Values

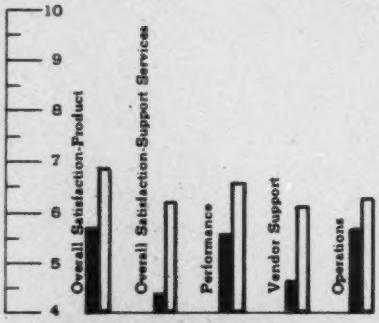
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

■ Specific Product Rating
▭ Group Average Rating

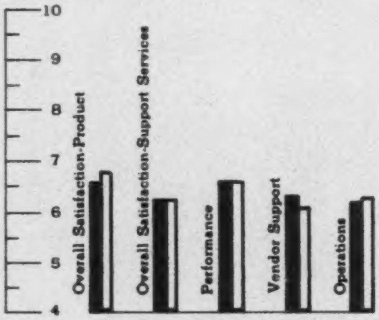
DATA CATALOGUE 2 • TSI International, 187 Danbury Road, Wilton, CT 06987 • 203-853-2884

40 responses • 47% judged package and 28% judged vendor outstanding • 20% actively seeking to replace package, with 10% citing unsatisfactory performance as reason.



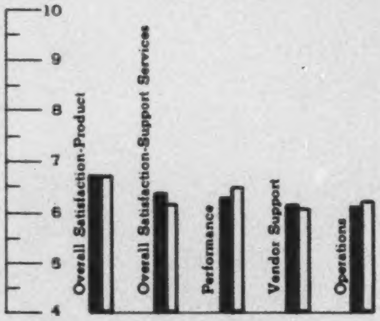
KEY/MASTER • TSI International, 187 Danbury Road, Wilton, CT 06987 • 203-853-2884

53 responses • 72% judged package and 66% judged vendor outstanding • 13% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



UCC TEN • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7150

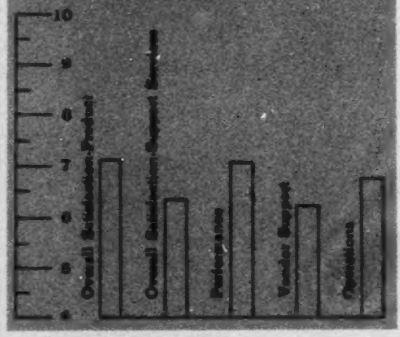
22 responses • 86% judged package and 64% judged vendor outstanding • 18% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



☐ PROGRAM DEVELOPMENT AIDS/ PROGRAMMING UTILITIES

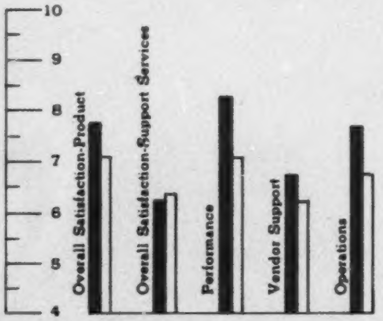
Group Average • 13 packages

618 responses • 78% judged package and 66% judged vendor outstanding • 10% actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



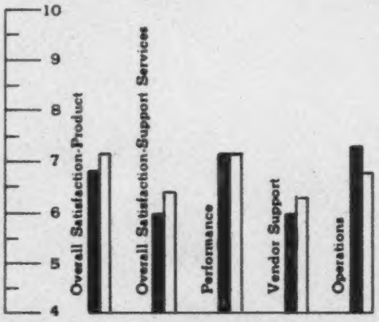
QUOTA II • Altergo Products, Inc., 400 W. Cummings Park, Suite 6900, Woburn, MA 01801 • 617-938-8811

24 responses • 97% judged package and 67% judged vendor outstanding • 17% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



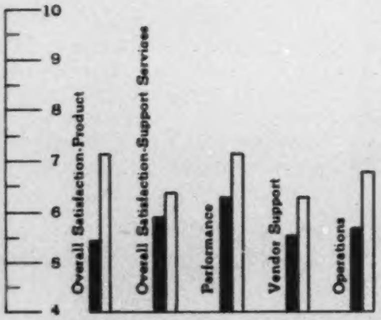
CPG • Altergo Products, Inc., 400 W. Cummings Park, Suite 6900, Woburn, MA 01801 • 617-938-8811

54 responses • 72% judged package and 52% judged vendor outstanding • 22% actively seeking to replace package, with 6% citing unsatisfactory performance as reason.



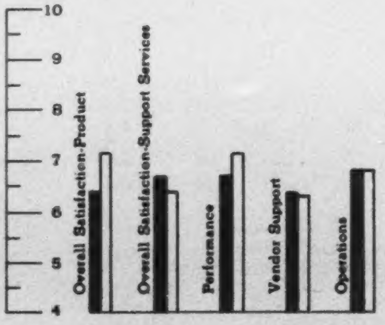
AUTOFLOW II • Applied Data Research, Rt. 206 & Orchard Road, CN 8, Princeton, NJ 08540 • 201-874-9100

22 responses • 36% judged package and 46% judged vendor outstanding • 5% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



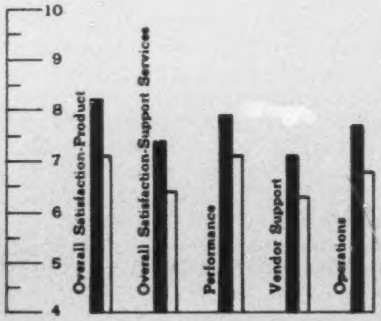
METACOBOL • Applied Data Research, Rt. 206 & Orchard Road, CN 8, Princeton, NJ 08540 • 201-874-9100

31 responses • 58% judged package and 68% judged vendor outstanding • 10% actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



VOLLIE • Applied Data Research, Rt. 206 & Orchard Road, CN 8, Princeton, NJ 08540 • 201-874-1900

61 responses • 97% judged package and 89% judged vendor outstanding • 11% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



Ratings Values

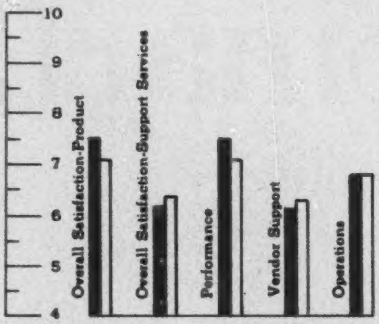
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

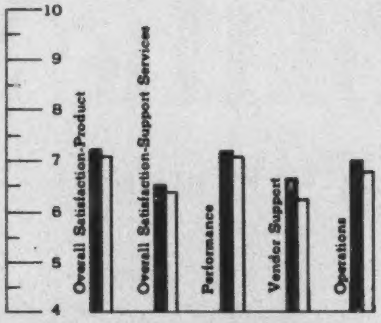
MANTIS • Cincom Systems, Inc., 2300 Montana Avenue, Cincinnati, OH 45211 • 513-662-2300

29 responses • 76% judged package and 66% judged vendor outstanding • 17% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



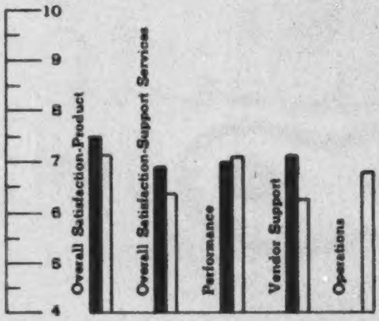
CA-OPTIMIZER • Computer Associates International, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6733

38 responses • 92% judged package and 76% judged vendor outstanding • 8% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



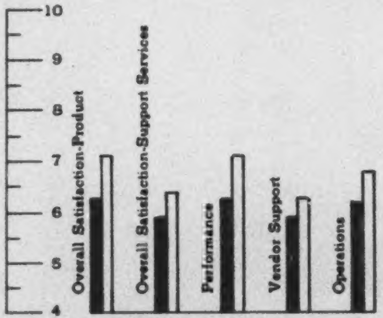
IMSL FORTRAN LIBRARIES • IMSL, Inc., Sixth Floor, NBC Building, 7500 Bellaire Boulevard, Houston, TX 77036 • 713-772-1927

44 responses • 89% judged package and 66% judged vendor outstanding • 2% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



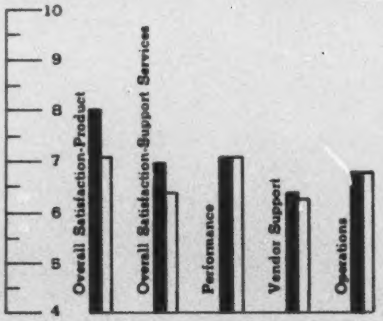
MARK IV • Informatics General Corp., 9441 LBJ Freeway, Dallas, TX 75243 • 214-231-1400

88 responses • 62% judged package and 56% judged vendor outstanding • 18% actively seeking to replace package, with 5% citing unsatisfactory performance as reason.



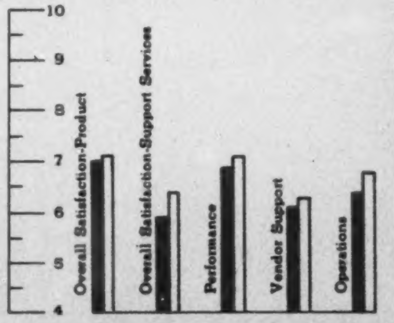
INTERTEST • On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, NJ 07024 • 201-592-0009

68 responses • 94% judged package and 83% judged vendor outstanding • 2% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



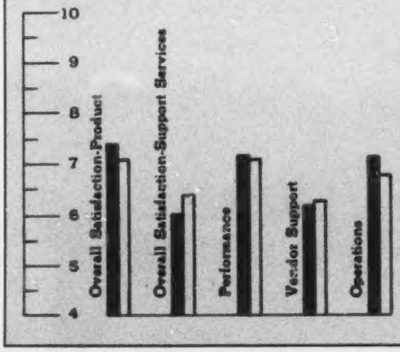
UFO • Oxford Software Corp., 174 Boulevard, Hasbrouck Heights, NJ 07604 • 201-288-1515

68 responses • 79% judged package and 57% judged vendor outstanding • 9% actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



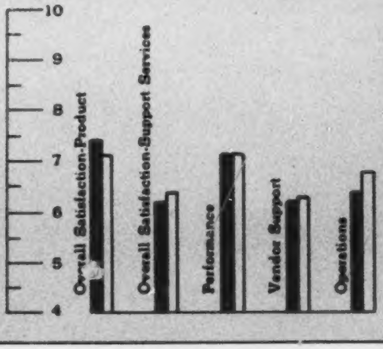
O-W-L • Pansophic Systems, Inc., 709 Enterprise Drive, Oak Brook, IL 60521 • 312-986-2263

70 responses • 86% judged package and 61% judged vendor outstanding • 13% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



NATURAL • Software AG of North America, International Center, 11800 Sunrise Valley Drive, Suite 1517, Reston, VA 22091 • 703-860-5050

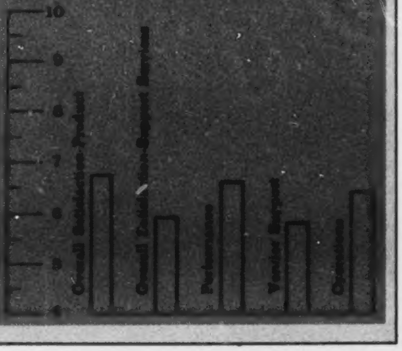
87 responses • 88% judged package and 65% judged vendor outstanding • 2% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



☐ COMMUNICATIONS SOFTWARE

Group Average • 13 packages

643 responses • 73% judged package and 59% judged vendor outstanding • 30% actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



Ratings Values

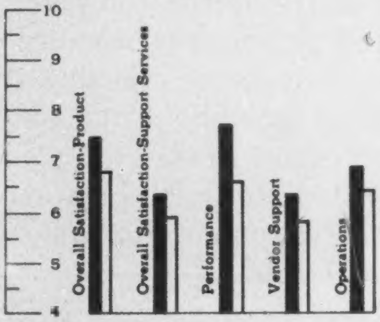
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

■ Specific Product Rating
□ Group Average Rating

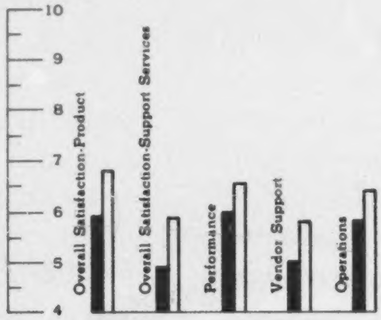
SHADOW II • Altergo Products, Inc., 400 W. Cummings Park, Suite 6900, Woburn, MA 01801 • 617-938-8811

52 responses • 83% judged package and 69% judged vendor outstanding • 44% actively seeking to replace package, with 6% citing unsatisfactory performance as reason.



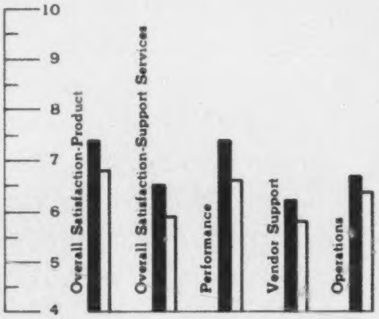
ADR/DATACOM/DC • Applied Data Research, Rt. 206 & Orchard Road, CN 8, Princeton, NJ 08540 • 201-874-9100

51 responses • 57% judged package and 37% judged vendor outstanding • 24% actively seeking to replace package, with 10% citing unsatisfactory performance as reason.



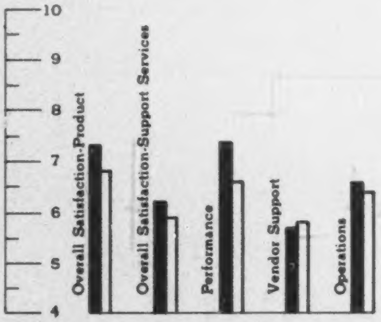
ADR/ROSCOE • Applied Data Research, Rt. 206 & Orchard Road, CN 8, Princeton, NJ 08540 • 201-874-9100

51 responses • 86% judged package and 71% judged vendor outstanding • 4% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



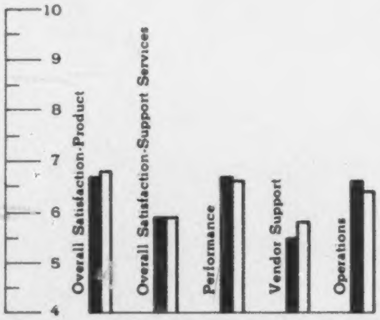
NDL • Burroughs Corporation, Burroughs Place, Detroit, MI 48232 • 313-972-9127

48 responses • 81% judged package and 69% judged vendor outstanding • 10% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



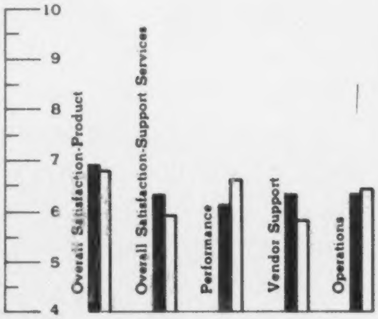
ENVIRON/1 • Cincom Systems, Inc., 2300 Montana Avenue, Cincinnati, OH 45211 • 513-662-2300

54 responses • 74% judged package and 54% judged vendor outstanding • 43% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



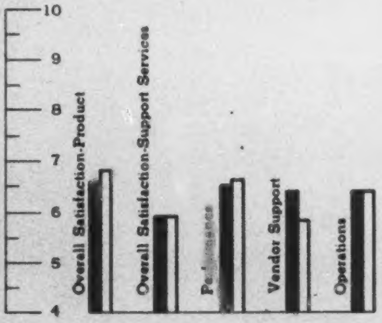
CICS/VS • IBM, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

38 responses • 83% judged package and 68% judged vendor outstanding • 3% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



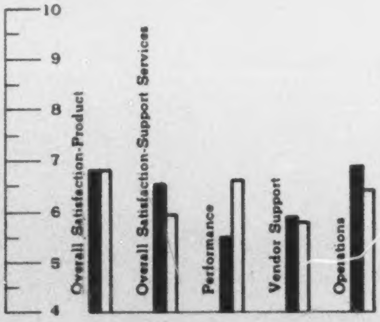
ICCF • IBM, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

31 responses • 68% judged package and 52% judged vendor outstanding • 23% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



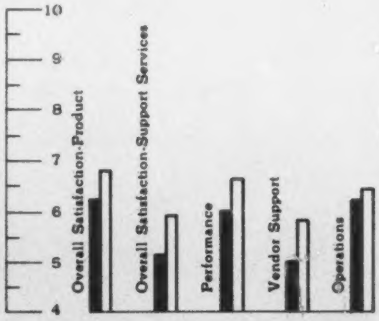
IMS/DC • IBM, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

24 responses • 83% judged package and 79% judged vendor outstanding • 4% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



INTERCOMM • Polygon Systems, 71 Fifth Avenue, New York, NY 10003 • 212-741-5200

31 responses • 65% judged package and 45% judged vendor outstanding • 71% actively seeking to replace package, with 13% citing unsatisfactory performance as reason.



Ratings Values

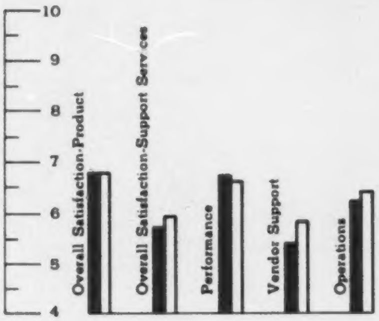
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

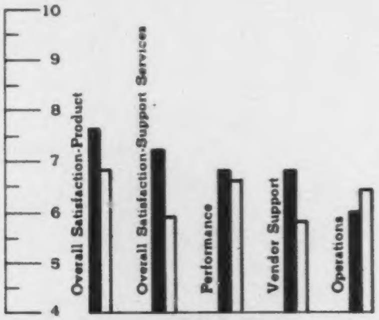
COM-PLETE • Software AG of North America, International Center, 11800 Sunrise Valley Drive, Suite 1517, Reston, VA 22091 • 703-860-5050

48 responses • 71% judged package and 54% judged vendor outstanding • 15% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



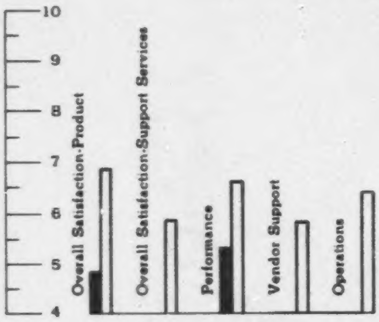
TONE 3 • Tone Software Corporation, 1735 S. Brookhurst, Anaheim, CA 92804 • 714-991-9460

19 responses • 84% judged package and 74% judged vendor outstanding • 37% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



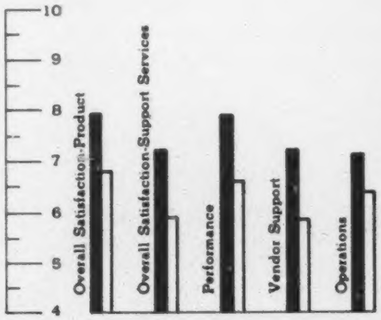
TASK/MASTER • TSI International, 187 Danbury Road, Wilton, CT 06987 • 203-853-2884

23 responses • 30% judged package and 13% judged vendor outstanding • 83% actively seeking to replace package, with 35% citing unsatisfactory performance as reason.



WESTI • Westinghouse Electric Corp., 2040 Ardmore Boulevard, Pittsburgh, PA 15221 • 412-636-3100

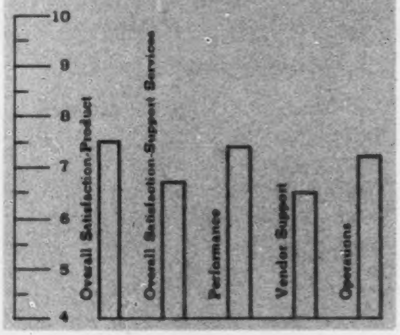
76 responses • 88% judged package and 83% judged vendor outstanding • 26% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



☐ UTILITIES/OPERATING SYSTEMS/ENHANCEMENTS

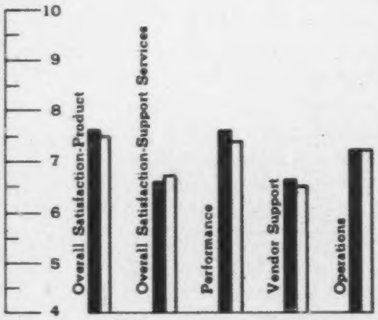
Group Average • 34 packages

1,813 responses • 86% judged package and 71% judged vendor outstanding • 10% actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



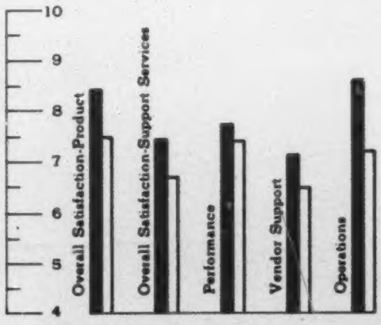
THE LIBRARIAN • Applied Data Research, Rt. 206 & Orchard Road, CN 8, Princeton, NJ 08540 • 201-874-9100

49 responses • 94% judged package and 78% judged vendor outstanding • 0% actively seeking to replace package



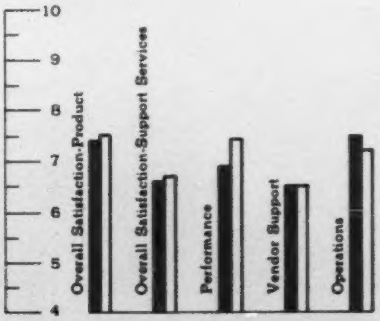
ACF2 • The Cambridge Systems Group, 24275 Elise Court, Los Altos Hills, CA 94022 • 415-941-4558

72 responses • 96% judged package and 81% judged vendor outstanding • 4% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



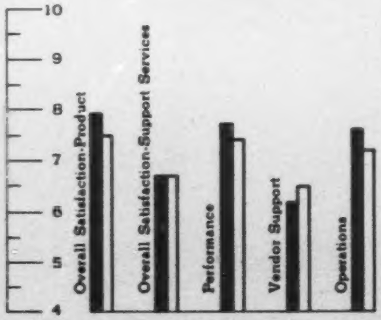
ASM2 • The Cambridge Systems Group, 24275 Elise Court, Los Altos Hills, CA 94022 • 415-941-4558

64 responses • 89% judged package and 70% judged vendor outstanding • 11% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



SUPER-MSI • CGA Software Products Group, 1370 Piccard Drive, Rockville, MD 20850 • 301-948-9600

48 responses • 92% judged package and 73% judged vendor outstanding • 8% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



Ratings Values

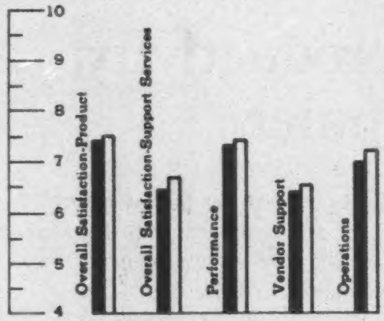
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

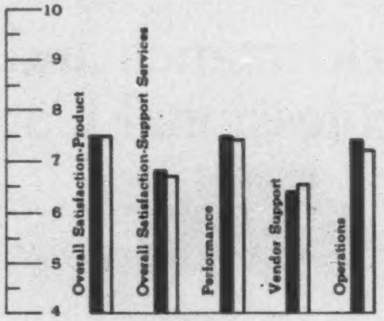
CA-DYNAM/D • Computer Associates International, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6733

56 responses • 91% judged package and 73% judged vendor outstanding • 7% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



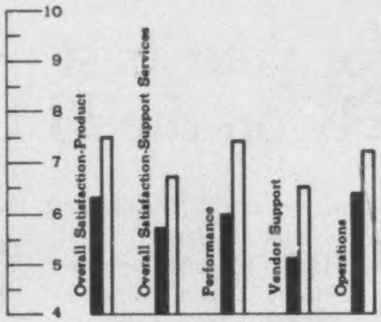
CA-DYNAM/T • Computer Associates International, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6733

65 responses • 85% judged package and 71% judged vendor outstanding • 8% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



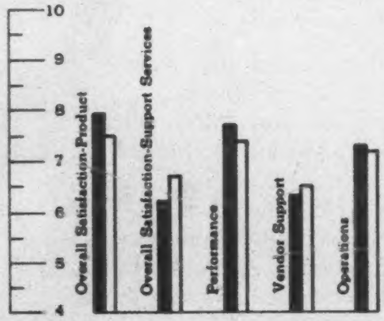
CA-JASPER • Computer Associates International, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6733

48 responses • 58% judged package and 56% judged vendor outstanding • 4% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



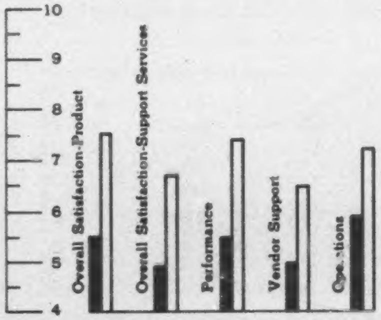
CA-RAPS • Computer Associates International, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6733

58 responses • 93% judged package and 69% judged vendor outstanding • 10% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



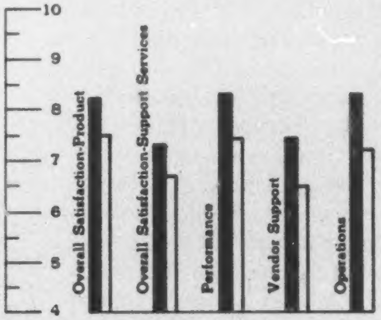
CA-SCHEDULER • Computer Associates International, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6733

29 responses • 52% judged package and 35% judged vendor outstanding • 10% actively seeking to replace package, with 7% citing unsatisfactory performance as reason.



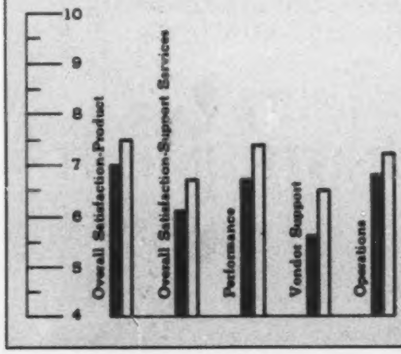
CA-SORT • Computer Associates International, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6733

65 responses • 94% judged package and 85% judged vendor outstanding • 6% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



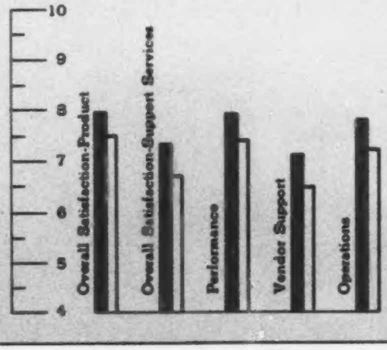
CA-TLMS • Computer Associates International, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6733

44 responses • 75% judged package and 54% judged vendor outstanding • 14% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



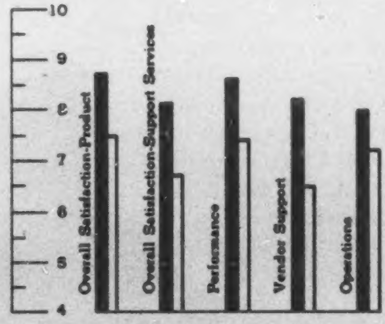
ABEND-AID • Compuware, 32100 Telegraph Road, Birmingham, MI 48010 • 313-540-0900

55 responses • 93% judged package and 76% judged vendor outstanding • 0% actively seeking to replace package.



SYSTEM/MANAGER • Corodale, Inc., 211 Congress Street, Boston, MA 02110 • 617-426-8780

69 responses • 100% judged package and 96% judged vendor outstanding • 10% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



Ratings Values

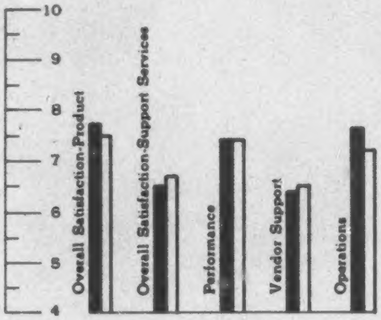
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

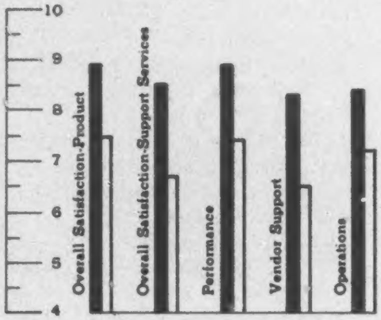
SHRINK • Informatics General Corp., 9441 LBJ Freeway, Dallas, TX 75243 • 214-231-1400

42 responses • 93% judged package and 69% judged vendor outstanding • 5% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



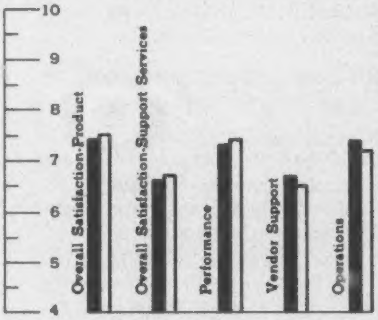
FAST/DUMP/RESTORE (FDR) • Innovation Data Processing, Inc., 970 Clifton Avenue, Clifton, NJ 07013 • 201-777-1940

74 responses • 99% judged package and 96% judged vendor outstanding • 1% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



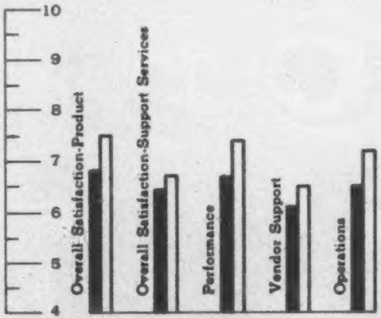
OS/DOS JOB ACCOUNTING SYSTEMS (JARS) • Johnson Systems, Inc., 8300 Greensboro Drive, Suite 700, McLean, VA 22102 • 703-821-1700

65 responses • 86% judged package and 69% judged vendor outstanding • 6% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



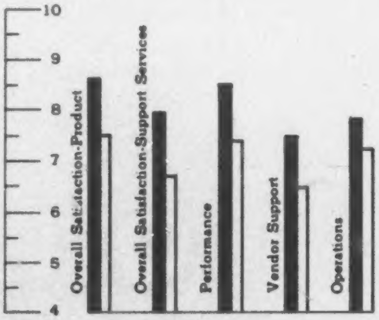
UMAX • Johnson Systems, Inc., 8300 Greensboro Drive, Suite 700, McLean, VA 22102 • 703-821-1700

47 responses • 81% judged package and 68% judged vendor outstanding • 6% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



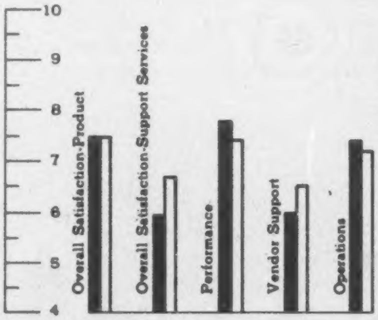
LOGOUT/MULTILOG • Macro 4, Inc., 1 West Hanover Avenue, Mt. Freedom, NJ 07970 • 201-895-4800

75 responses • 99% judged package and 91% judged vendor outstanding • 7% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



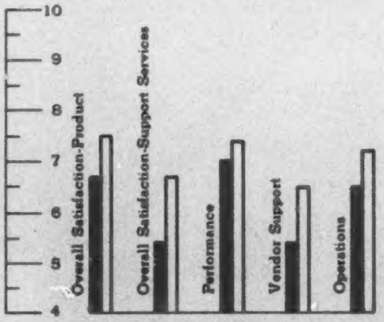
MICOS • Mini-Computer Systems, 399 Fairview Park Drive, Elmsford, NY 10523 • 914-592-8812

28 responses • 82% judged package and 61% judged vendor outstanding • 21% actively seeking to replace package, with 7% citing unsatisfactory performance as reason.



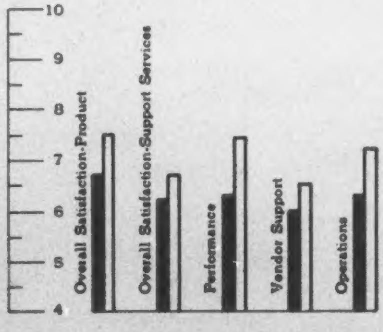
EDOS • Nixdorf Computer, 300 Third Avenue, Waltham, MA 02154 • 617-890-3600

27 responses • 74% judged package and 41% judged vendor outstanding • 37% actively seeking to replace package, with 7% citing unsatisfactory performance as reason.



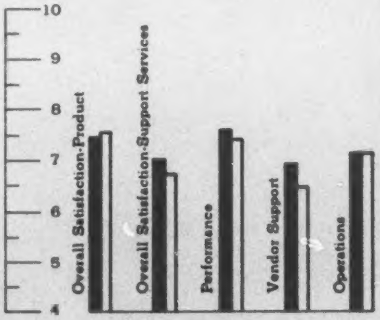
KOMAND • Pace Applied Technology, 7900 Sudley Road, Suite 602, Manassas, VA 22110 • 703-369-3200

45 responses • 76% judged package and 62% judged vendor outstanding • 11% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



PANVALET • Pansophic Systems, Inc., 709 Enterprise Drive, Oak Brook, IL 60521 • 312-986-2263

41 responses • 90% judged package and 76% judged vendor outstanding • 2% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



Ratings Values

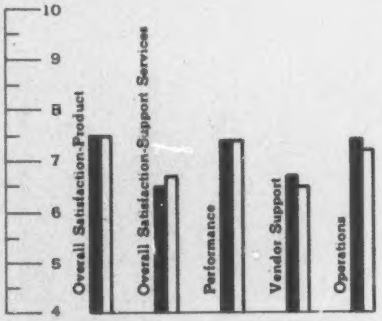
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

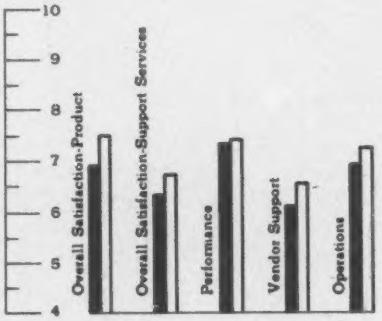
EPAT • SDI, Inc., 1700 South El Camino Real, P.O. Box 5801, San Mateo, CA 94402 • 415-572-1200

41 responses • 88% judged package and 66% judged vendor outstanding • 32% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



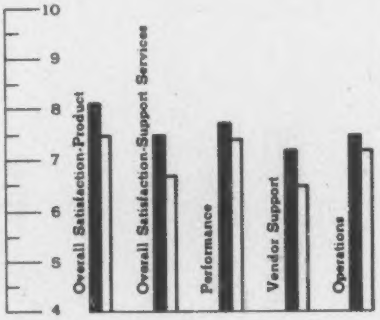
GRASP • SDI, Inc., 1700 South El Camino Real, P.O. Box 5801, San Mateo, CA 94402 • 415-572-1200

23 responses • 83% judged package and 57% judged vendor outstanding • 52% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



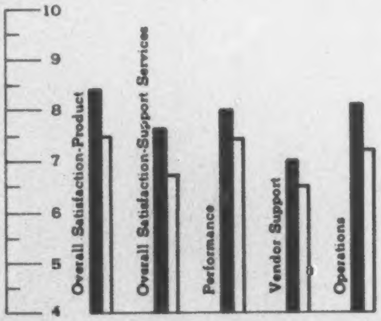
DMS/OS • Software Module Marketing, Crocker Bank Building, Penthouse, 1007 Seventh Street, Sacramento, CA 95814 • 916-441-7234

61 responses • 92% judged package and 89% judged vendor outstanding • 5% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



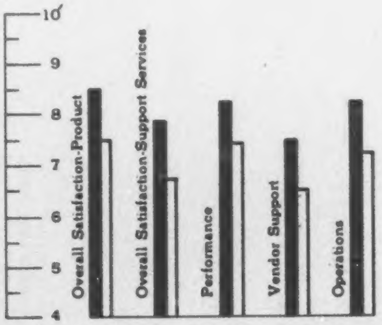
DOS/MVT/VSE • Software Pursuits, Inc., 444 Market Street, Suite 800, San Francisco, CA 94111 • 415-392-7171

65 responses • 95% judged package and 81% judged vendor outstanding • 14% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



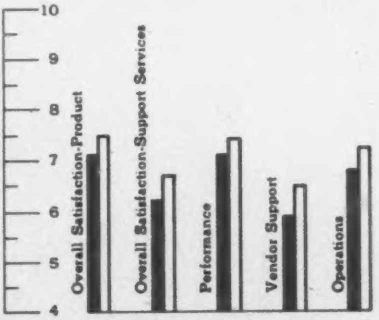
SYNCSORT • Syncsort, Inc., 560 Sylvan Avenue, Englewood Cliffs, NJ 07632 • 201-568-9700

60 responses • 97% judged package and 88% judged vendor outstanding • 2% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



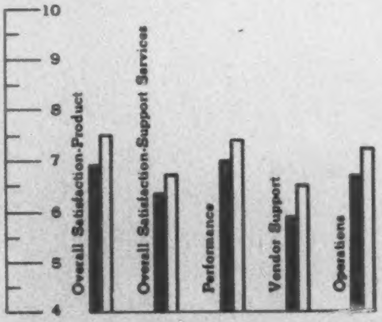
D/FAST • Tower Systems, 19782 MacArthur Blvd., Suite 365, Irvine, CA 92718 • 714-752-8263

64 responses • 78% judged package and 59% judged vendor outstanding • 17% actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



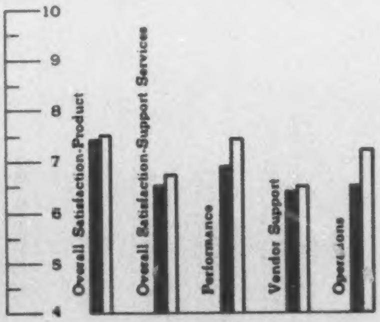
T/FAST • Tower Systems, 19782 MacArthur Blvd., Suite 365, Irvine, CA 92718 • 714-752-8263

66 responses • 79% judged package and 67% judged vendor outstanding • 11% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



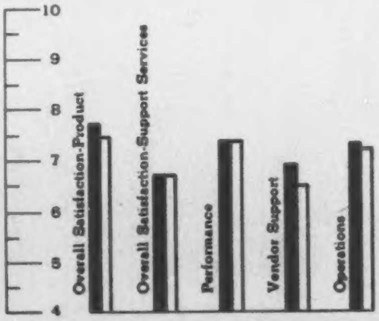
UCC ELEVEN • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7150

48 responses • 87% judged package and 67% judged vendor outstanding • 4% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



UCC ONE • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7150

58 responses • 93% judged package and 79% judged vendor outstanding • 2% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



Ratings Values

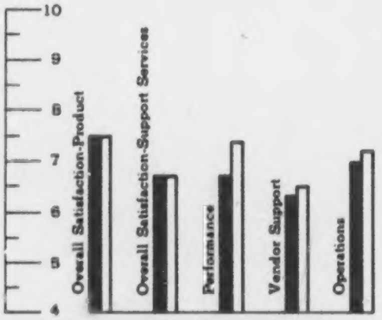
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

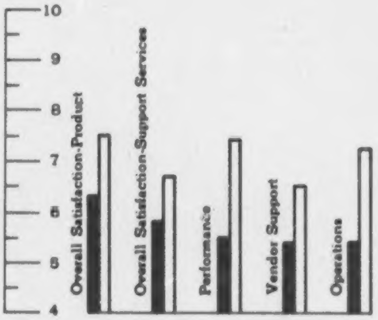
UCC SEVEN • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7150

58 responses • 88% judged package and 67% judged vendor outstanding • 3% actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



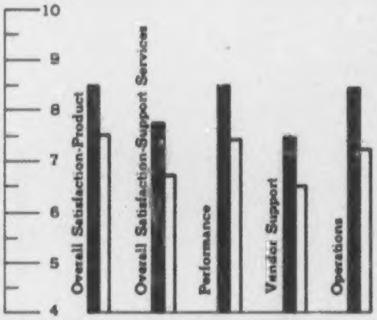
UCC TWO • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7150

34 responses • 59% judged package and 56% judged vendor outstanding • 21% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



DISK UTILITIES • Westinghouse Electric Corp., 2040 Ardmore Boulevard, Pittsburgh, PA 15221 • 412-636-3100

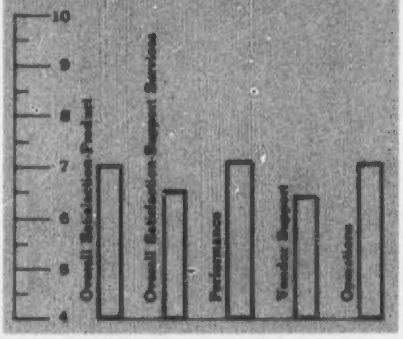
72 responses • 99% judged package and 88% judged vendor outstanding • 3% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



☐ MONITORING & PERFORMANCE AIDS

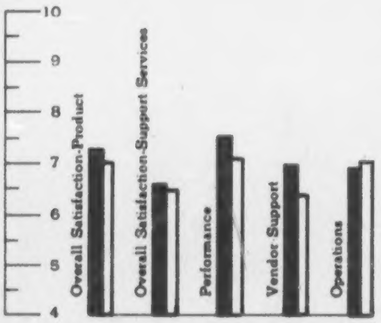
Group Average • 10 packages

433 responses • 79% judged package and 71% judged vendor outstanding • 12% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



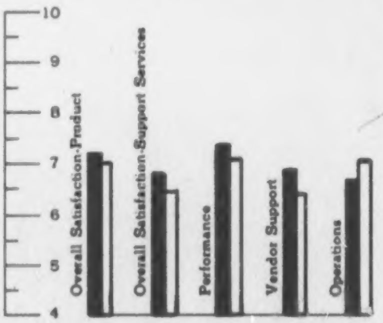
LOOK • Applied Data Research, Rt. 206 & Orchard Road, CN 8, Princeton, NJ 08540 • 201-874-9100

80 responses • 86% judged package and 72% judged vendor outstanding • 10% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



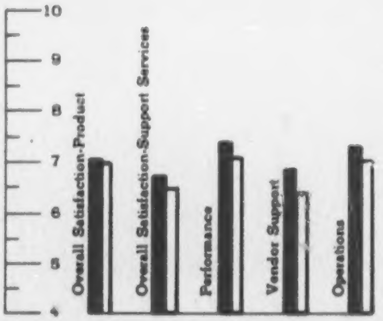
BEST/1 • BGS Systems, One University Office Park, 29 Sawyer Road, Waltham, MA 02254 • 617-891-000

54 responses • 87% judged package and 83% judged vendor outstanding • 11% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



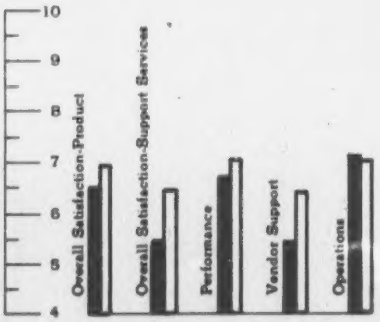
CAPTURE/MVS • BGS Systems, One University Office Park, 29 Sawyer Road, Waltham, MA 02254 • 617-891-0000

52 responses • 79% judged package and 83% judged vendor outstanding • 12% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



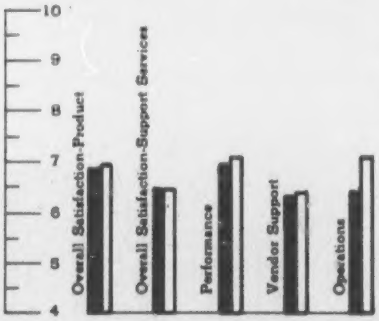
CMF/MONITOR • Boole & Babbage, Inc., 510 Oakmead Parkway, Sunnyvale, CA 94086 • 408-735-9550

63 responses • 73% judged package and 59% judged vendor outstanding • 21% actively seeking to replace package, with 6% citing unsatisfactory performance as reason.



CONTROL/IMS & CONTROL/REAL-TIME • Boole & Babbage, Inc., 510 Oakmead Parkway, Sunnyvale, CA 94086 • 408-735-9550

49 responses • 80% judged package and 69% judged vendor outstanding • 12% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



Ratings Values

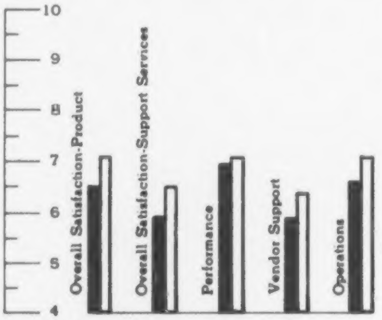
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

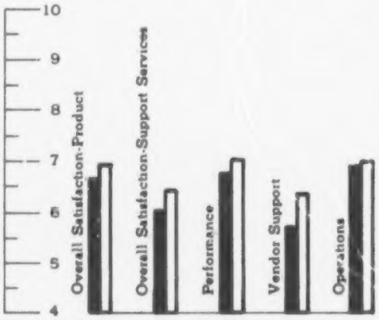
RESOLVE-RESOLVE/CICS • Boole & Babbage, Inc., 510 Oakmead Parkway, Sunnyvale, CA 94086 • 408-735-9550

39 responses • 74% judged package and 61% judged vendor outstanding • 10% actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



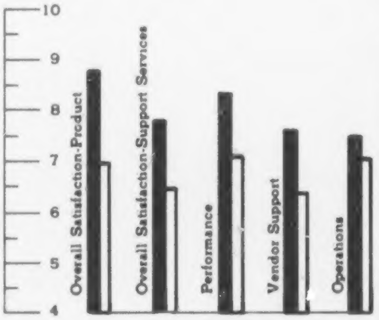
TSA/PPE • Boole & Babbage, Inc., 510 Oakmead Parkway, Sunnyvale, CA 94086 • 408-735-9550

38 responses • 71% judged package and 63% judged vendor outstanding • 5% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



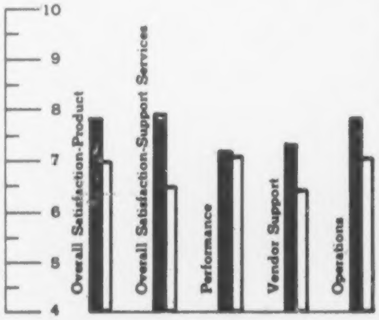
OMEGAMON • Candle Corporation, 10880 Wilshire Blvd., Suite 2404, Los Angeles, CA 90024 • 213-470-2277

32 responses • 97% judged package and 81% judged vendor outstanding • 0% actively seeking to replace package.



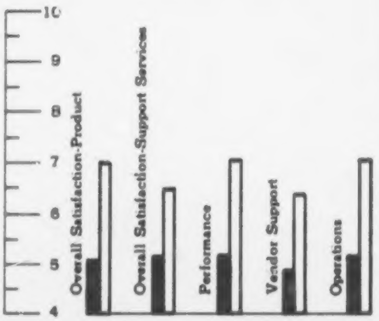
TSO/MON • Morino Associates, 8133 Leesburg Pike, Suite 602, Vienna, VA 22180 • 703-734-9494

40 responses • 85% judged package and 95% judged vendor outstanding • 8% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



COMPUT-A-CHARGE • Value Computing, Inc., 498 North Kings Highway, Cherry Hill, NJ 08034 • 609-482-2500

28 responses • 54% judged package and 46% judged vendor outstanding • 31% actively seeking to replace package, with 15% citing unsatisfactory performance as reason.



REPORT AVAILABLE

This systems software survey is based on a forthcoming report in Data Decisions' *Software*, a monthly information service covering systems and applications software. Additional information on Data Decisions' subscription services and custom consulting capabilities is available from Data Decisions, 20 Brace Rd., Cherry Hill, NJ 08034, (609) 429-7100.

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For systems people, there is no clear path to the Land of Oz. Most dpers have to create their own Yellow Brick Roads.

DP CAREER PATHS

by Kate M. Kaiser

According to many dp people, the phrase "career paths of systems professionals" is an oxymoron: a figure of speech combining contradictory ideas, like jumbo shrimp, football scholarship, and business ethics. Why? Because people who work as senior systems analysts or as project leaders have few possibilities for hierarchical advancement, and any available paths are often blocked. Many firms have no formalized structure in the MIS department, partly because the field is still relatively new. Because evaluating technical expertise is difficult, the human resource function in most firms must turn the usual recruiting, screening, and developing roles over to the MIS director. Since many MIS directors come from such a technical orientation, their management style might be more "seat of the pants" than that of some of their counterparts in marketing or finance.

The career path model used by most firms is a variation of entry level programmer to analyst to project leader to manager. Sometimes, the adjectives junior and senior are used, along with combinations of the above three titles, linked by slashes. A typical organization design is shown in Fig. 3. A more progressive approach is displayed by firms that separate the technical and application functions in parallel tracks with equivalent stature. The bind for most individuals is that they attain the level of senior systems analyst in four to 10 years, often because of turnover and demand rather than ability. Individuals who want a continuing challenge see few formal routes that provide motivation. The MIS director is faced with a similar dilemma, since it is almost impossible to move from MIS to top management. As firms recognize the information resource's value, this may change, but it certainly hasn't happened yet. Conversations with dp personnel about career paths are flavored with the words dead end, stopped up, and isolated.

Long-term data concerning systems staff are scant except for government statistics collected by the Bureau of the Census and the Department of Labor (DOL). These data do not track individuals except by chance on the DOL annual sample of job mobility, which started in 1981.

Beginning in 1979, the author collected data over a four-year period on the jobs of systems and user staff who were involved in major development projects in large private firms. Of the 108 participants in 1979, 65 people reported to a systems department and 43 to a user area. Users were included for three reasons: to compare employment differences, to collect user perceptions of systems career paths, and to see if users crossed over to systems. Twenty participants who were users when the survey was begun and who intended to remain users until 1988 were not included for further study. By 1983, two of the original 108 were deceased, four had retired, 15 had no known whereabouts, seven were contacted but did not respond, and one had left the work force to raise a family, making a total of 59 respondents. Between 1982 and 1983, professionals from 35 firms were contacted by telephone and given the choice of a personal interview by phone or a mail questionnaire with phone follow-up. Ten chose the questionnaire. The interview was held within 10 days of contact. Updates on the early interviews were obtained in 1983. The questions focused on updating the respondent's employment history over the past four years and on his or her professional aspirations for 1988.

The survey offers information on 36 firms (20 in manufacturing, nine in the financial area, three service firms, and four utilities). All of the firms are among the Fortune 500 or the top 50 within their fields. Many are located in the Midwest, where the recession has had an obvious impact. It was assumed that these large firms would offer more sophisticated career possibilities to MIS staff because of their potential resource level, compared to that of smaller firms. In 1979, the number of firms that respondents worked at was 27; in 1983, the number rose to 35 after eight people left their original employers. Only two participants had been with three firms during that four-year period. None of the companies are in the dp area.

Demographic data about the final 59 participants are contained in Fig. 2. In drawing a composite of the nine women and 50 men, we see a mature dp professional who spent a significant amount of time with a firm after working for one or two other organizations. There are exceptions among the real-life respondents, however: two individuals who are very close to retirement spent their entire work lives with one firm. Four of the highest salary figures belong to users now in top management positions. These users were included because they were part of a development team in 1979, and two have MIS reporting to them now or will in their next positions. Two of the other respondents are in the top MIS in their divisions and have been there since 1979. The salary levels of the other 53 respondents suggest that they hold senior systems analyst or middle management data processing positions. Such high-level positions may be a result of their tenure in dp. Twenty of the respondents spent their entire work lives in data processing, with an average of 16.75 years. The grandfather of this group (by virtue of his seniority and his two grandchildren) started on tab equipment.

Included in the survey are some of the early systems professionals. The observations of such a vanguard group are valuable, because these trailblazers are now managing and working with younger systems professionals who have had the opportunity to get formal MIS training. Degrees in computer science did not become available until the early '70s, and MIS degree programs were devised even later.

STUDY GROUP IS STABLE

As for turnover, our study group is a surprisingly stable set. Fifteen have stayed with their original firms for an average of 19 years. Most have been with their firms 12 years. This evidence supports popular notions that turnover is related to age. One user who worked at five firms is due to retire in five years and has been with his present company for 15 years. The systems person who was with eight firms has been with his current employer 18 years. In general, these people have been at their present organizations for two thirds of their work lives, a fact that explains why 64% of

ILLUSTRATION BY BERNARD BONHOMME

FIG. 1

PAST, PRESENT, AND FUTURE TITLES

1979 TITLE	NO. OF TITLE CHANGES 1979–1983	1983 TITLE	1988 ASPIRATION
Junior SA	4	EDP Auditor	Project Leader
P/A	1	Senior P/A	Senior SA Advisor
Mgr. Tech. Systems	3	MIS Director	VP Info. Systems
Manager Sys. Devel.	1	Director	VP Administrator
Manager Dp	0	No Change	Manager Dp
SA	2	Materials Manager	General Manager
Systems Consultant	1	Mgr. Sys. & Methods	VP MIS
Sys. & Methods Admin.	1	Systems Consultant	Not yet defined
Project Manager	0	No Change	VP Area Manager
Area Manager	0	No Change	Dept. Manager
Asst. VP Community Banking Coord.	1	VP Community Banking Coord.	More "consulting"
Systems Consultant	2	VP Manager Telecom	Corporate Telecom Manager
P/A III	2	Advisor Computer Systems	Same until retirement (after '88)
Mgr. Mgmt. Systems	1	Mgr. Prime Services	Director MIS
Accounting Analyst	0	No Change	Accounting Manager
P/A	2	Part-time P/A	Tech. Consultant
Senior SA	4	*Supervisor Tax Sys.	Partner
Systems Manager	0	No Change	Systems Science Manager
SA	1	MIS Specialist	Manager Operations
MIS Specialist	2	*DB Administrator	Director MIS
Project Manager	0	No Change	Director
P/A	4	Coord. Info. Center	Division Manager
Sr. Methods Analyst	4	*Senior SA	Coordinator
Project Leader	2	*Contract Programmer	Program & Sys. Design
P/A	1	Computer Performance Analyst	No goal
P/A	4	**Senior SA/Prog.	Senior SW Programmer
SA/Programmer	1	SA	Senior SA
Supervisor Plant Eng.	2	Sr. Supervisor Sys. Operations	Divisional Buyer Purchasing
Programmer	3	Supervisor IS (I)	Supervisor IS (II)
Methods & SA	0	No Change	Medical school
SA	0	No Change	Teaching
Sys. Dev. Specialist	1	Sys. Dev. Supervisor	Systems Manager
Project Manager	1	2nd VP & Sys. Officer	Sys. Dept. Manager
Staff Assistant	0	No Change	Computer Sys. Div. Manager
Project Manager	1	No Change	Break Unit Head Dp
Systems Officer	5	Senior Sys. Planner	Operations Manager
Consolidation Acct.	5	Project Leader	Consultant
Applications Analyst	8	**Assoc. Dir. Medical Products	Consultant
Software Analyst	4	Section Manager	Director MIS
Op. Consultant	3	VP Marketing	VP Production Planning & Strategic Planning
SA	1	Sr. Proj. Manager	Sr. Tech. Project Mgr.
Project Manager	3	Assoc. Dir. IS Policies & Planning	MIS Director
Project Manager	2	Senior SA	Super. Integrated IS (II)
Mgr. MIS	0	No Change	Director IRM
Sr. Sys. Consultant	2	*Asst. to VP Planning & Admin.	Planning

*—One firm change
**—Two firm changes
P/A—Programmer Analyst
SA—Systems Analyst
Roman Numerals I, II, or III—Levels I, II, or III

Note: This list excludes retirees, dropouts, and users who plan to remain users.

them responded that they are organization loyal.

In 1983, 25% report to a user department and 75% report to a systems area. These percentages may not be precise, because some user departments have a resident systems analyst. Also, some true users intend to stay in systems only long enough to acquire technical skills and then return to their functional areas. Nine such "users" were included as a control group.

Eighty percent of the respondents are in supervisory roles and can be grouped as generic senior systems analysts/project leaders because of their functions. Three systems professionals are closer to programmer/analysts. One of these three who worked full-time in 1979 went part-time four years ago following maternity leave.

Formal training is varied. Because of the maturity of the sample there are only six who have bachelor's degrees in computer science. Since so few had the opportunity to pursue a degree in their field, why did they consider a dp career? Most couldn't have said, "I want to grow up to be a systems analyst," because the field didn't exist when they were first considering their career goals. Some sought formal training, some experienced on-the-job motivation, and some had "deliberate accidents."

Ed was in the Merchant Marine, his wife was pregnant, and he saw an ad for a computer course in the paper. Mickey was an artist and found himself drafted. The army did not value his artistic skills, so he took a dp training course. Mickey comments that his artwork is very precise, and he feels he uses his creativity in systems design. Others mentioned taking computer course electives, which inspired them to go into the field. Mark and Rob were steered by employment agencies. Jack credited an IBM sales rep as his lead.

On-the-job motivation means being in a situation that evoked the respondents' interest or curiosity. For instance, Bill was a user who got tired of hearing the systems staff use dp jargon and then say, "We can't do it." He thought they did not listen and was frustrated with explaining what he felt to be merely common sense. Dp relaxed its recruiting rules and he became systems staff. Several people mentioned they had been in a scientific environment, were handed a manual, and told in essence to "go make this work on a computer." One CPA was trained in edp auditing while working for a Big Eight accounting firm. A couple of Navy veterans received exposure through their assignments. Eighteen years ago a job in process control forced Gene to learn about computers. He didn't like it at first but was soon hooked.

The "deliberate accidents" are more

amusing. In 1956, on a research lab tour, one college student was offered a job plotting trajectories from printouts. Dan went to an agency and said he wanted "something different," and he got it. Connie tagged along with a friend who was taking the civil service exam in programming. As an 18-year-old, Don carried tests back and forth to departments for a year. He was fortunate that his boss was the manager of software and sent him on for training to be an associate programmer.

A few of the users who were assigned as project liaisons found systems intriguing because of a dp project they worked on in 1979, and decided to learn more. One former accountant is completing his master's in computer science and is now a systems analyst.

JOB TITLE DATA VALUABLE

In regard to job descriptions, dp is similar to other areas in that the job title may not reflect the actual functions of the position. For the purposes of this study, however, job title information is valuable, because a change in title often reflects a promotion. The title also indicates whether the individual is in a supervisory role. This sample includes few novices; therefore, by 1983, 80% are in management roles via promotions, according to the data (see Fig. 1). In five cases a change was made from systems to a user area, and in two cases the reverse was true. Lateral moves within a systems area to develop more technical skills involved three people. A change in title does not indicate a change in compensation.

Some titles appear to be in a systems area, but the person may actually report to a user area. One individual moved from one bank to another over the four-year period, but his title did not change. In one organization a new MIS director came in and relabeled all systems staff as programmer/analysts. This title change upset two systems people, because they felt it was a demotion even though their salaries remained the same. A year later one of these two was assigned a supervisory position and a new title within the same organization. Fourteen who are still with their 1979 firms have the same job titles. During the interviews, it was evident that three of those people were unhappy. One who had been with his firm for nine years originally said he would stay put until his boss moved. An update six months later revealed that he had been released and was doing contract work. The other two are leaving the business environment altogether. They both discussed cutbacks and boredom with maintenance activity. One of these two hadn't received a raise in two and a half years. Because of a maternity leave during 1980, Rhonda works part-time now in the same 1979 job title. Her responsibilities moved up two levels, but her title remains the same because of cutbacks and her part-time status.

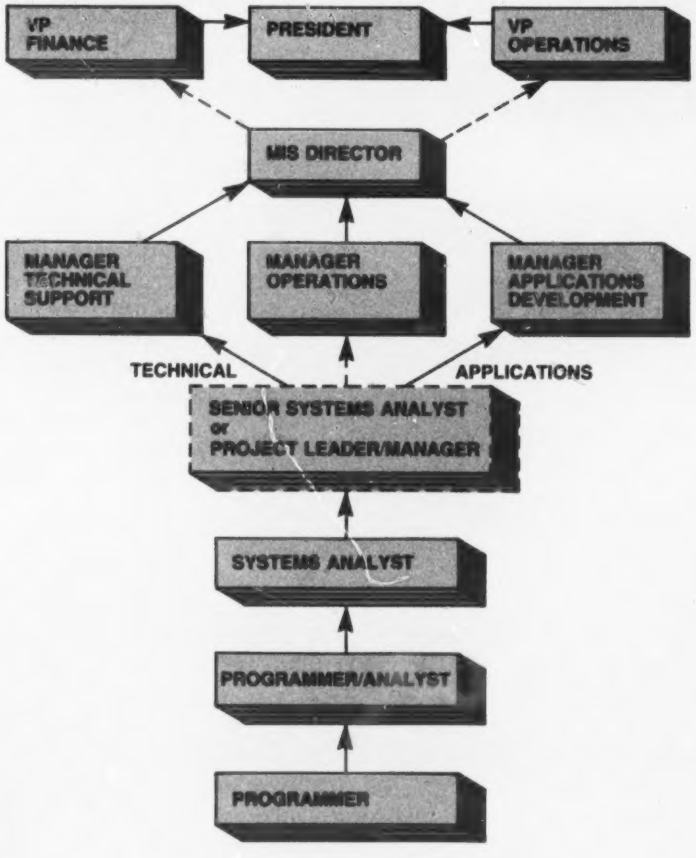
FIG. 2

PARTICIPANTS' DEMOGRAPHICS

	NUMBER OF RESPONDENTS	AVERAGE	RANGE
Age	58	42.2	27–62
Salary	45	44.3	25–100
Years working	58	18.4	6–43
Years in dp	58	12.9	0–35
Years with '83 firm	57	12.4	.3–43
No. of firms	59	2.5	1–8

FIG. 3

POSSIBLE SYSTEMS PROFESSIONAL CAREER PATH



---- INDICATES POSSIBLE BUT NOT LIKELY PATHS OR SEPARATIONS

The average number of job changes is 1.7, with one woman having eight different titles. She considers her career unusual for the business and dp worlds and for women, and attributes these promotions to the unparalleled growth of MIS in her firm and her luck in timing. Her last move was out of the firm she had been with for six years, because she wanted to learn about a variety of industries as a consultant and because of "an irreconcilable style difference with new management." Seven users and 16 systems people changed firms (three had done so twice), making the average yearly turnover rates 5.6% and 6.9%, respectively. Although some mentioned the recession, very few indicated that their canvassing extended beyond the Sunday paper. Several had had interviews since 1979, and serious considerations about changing jobs involved family and job challenge, but not money.

Formal training, on-the-job motivation, and being in the right place at the right time all contribute to career advancement.

Turnover rates for the MIS departments were surveyed when available. Two managers indicated a rate of 10%. One, a bank dp manager, attributed this rate to an educational commitment to provide the dp staff with new skills and career guidance. In separate interviews, his staff confirmed the effectiveness of this program. One director in charge of MIS human resources said that in 1979 his MIS department's turnover was 40%. Because of the economy and the assistance of industrial psychologists, it came down to 8% in 1981 and has remained there. But he thinks this is too low. He believes 10% keeps the department energized; any lower and it stagnates.

Gary left a job because his duties involved external client consultation. He felt he did not belong anywhere. His was a case of turnover to seek identity within an organization and to prevent the feeling of being adrift. Besides changing firms, another type of turnover that dp managers should be aware of is the move to a user area and vice versa, or what we call crossover.

Hal has been in sales order entry, and now he calls it "electronic order entry." He is basically a user but says, "Half of my time is spent on the sixth floor" (dp). Some firms encourage this crossbreeding. Pete and Brian, of different firms, both mentioned systems personnel who had acquired APICS (Association for Production and Inventory Control Systems) certification. Gil, who has a strong technical background, has been reporting to a user area since 1973, but he is a dp coordinator. It is not uncommon for Tom to be a user and have dp reporting to him—he is controller. More unusual is the case of Gary's boss, the vp of finance, who was formerly a systems person but is now a CPA. Curt mentioned clerical workers who used dp skills for upward mobility. Curt thinks it is easier to train a business-oriented person in dp than to teach business skills to a dp person. As a systems manager, Curt actively recruits accountants. Len, a plant engineering supervisor in 1979, now supervises network control in dp operations. He wants to go into purchasing. Brian feels like an expert because he is the token "systems person." A systems liaison to purchasing in 1979, he now manages the area.

Boredom sets in and people start looking. In 1979, when Curt was a systems analyst, he told his boss that he was bored, so his boss gave him more work. That wasn't quite what he had in mind, and he clarified that point with the boss. At 33, Curt is now associate director of information policy and planning after being manager of operations (for which he had no experience or training) at his 1979 firm—a major mining and processing firm with 14 divisions. He is organization and department loyal "as long as MIS is not a dead end."

From our original 59-person sample, nine were in systems and have now switched to user departments and nine others have gone from user areas to systems. These people comprise one third of the study group, and they exude self-satisfaction because of their versatility. They are also nervous about losing their expertise in their former arenas.

CAREER GOALS FOR 1988

For such a short time span, these findings are interesting. In the ever-changing field of MIS, projecting from the past is dangerous. We asked the sample group to project what positions they would like to hold in 1988, regardless of their firms' career path structures. Dan is working on minis for EFT applications. He doesn't care

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what his title will be in 1988 or if he'll be working on minis. But he does care very much that whatever he works on is state-of-the-art technology. Rob said his 1988 job isn't yet defined, because he hopes it's in an area that hasn't yet been developed.

The two individuals who have deliberate plans to leave the profession by 1988 are now doing maintenance, and referred to it as "criminal work" and babysitting. Their organization is in a depressed industry and their systems group lost 10 members who won't be replaced soon because of user layoffs. One wants to teach, and the other is going to medical school.

Nine former systems staffers who worked in a user area want to stay in it, and four more who have not worked there see it as their 1988 home. Some said that dp is a dead end. One 1979 user, who is now in systems, indicated that he is there only to acquire technical skills. He realized the value of these skills while working on a project three years ago and now supervises some of the systems staff with whom he worked on that project. Another 1979 accountant will stay in dp because of the challenge.

Only one 1983 user wants a 1988 dp home. Few systems people chose the job title directly above their current positions. They either jumped several steps (sometimes out of dp) or made up a title that doesn't currently exist in their company. Apparehtly, the field has changed so rapidly that it's hard to imagine what lies ahead. The participants in our sample seem to relish this uncertainty rather than be anxious about it. For some, their 1983 job did not exist in 1978 so they look forward to being the first (fill in the blank) in 1988. Most are clearly upward, often through user areas, though two wish to move laterally to acquire more technical skills.

One consensus of the sample was that you make your own career path in or out of the organization. An unexpected response was that another person had pushed or motivated the participants in certain directions. Nine of the participants mentioned one or several people who "wouldn't let me fail," "really believed in me," "told me not to wear short-sleeved shirts," and "taught me how to deal with people." Older role models were perhaps not present in the systems analyst function, but in an advisory capacity mentors were appreciated. In one bank, three participants talked at length of the same person named Howard, who had convinced all three that they were each unique and had enough talent to do anything.

THREE MAJOR FINDINGS

This survey produced three major findings, which I'd like to explore in detail.

First, little evidence was found of formal career paths. Existing informal career paths seem limited in comparison with other occupations or for a group that has such a strong need for career growth. It is possible that a formal career path may not be necessary. Dp personnel who are apparently successful (no measurements were attempted) find a path for themselves. Mark, Curt, Gary, Dana, and Hal had positions created for them. There was no indication whether these opportunities came about through their own initiative or that of a supervisor.

One might ask how career paths can be designed when it is so difficult to anticipate what the interaction of technology and organization structure will be in five years. It is not clear whether the "dead end" on paper is a motivator or a practical constraint. If dp management attempts more counseling and

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The field has changed so rapidly that it's hard to imagine what opportunities lie ahead.

expands its structures, would this be stifling to ''the free spirit'' (as one dp manager put it) of dp staff? Future MIS directors should assess career development programs as to their effectiveness for retaining key personnel.

The words variety, challenge, growth, and learning kept coming up in the participants' responses. Brian likes to see ''barriers broken down.'' Connie says it is ''exciting that the pressure is on and then off.'' Rhonda says her work is challenging because she is learning, then teaching that skill to someone, then learning and teaching again. Bill says you have to have the temperament to ''answer problems while 10 people are leaning over your shoulder.'' When asked why they have not been lured away, several respondents said they could make the same money elsewhere, but the variety of responsibilities in their jobs keeps them there. Dana says, ''Dp people like change. If they don't get it, they change jobs.''

Secondly, it was a surprise to find this sample so organization loyal. The maturity of the field is one explanation. Turnover rates in previous years were compiled about people with less dp experience. This vanguard group has both professional and chronological maturity, which can be linked to security needs. Both Don and Mickey (in their early thirties) mentioned pension benefits. Future research should segment age groups and years of MIS experience to better analyze turnover data. A number of the participants expressed gratitude to their organizations for the opportunity to develop what they perceived as the best technical skills. Crossover may explain the unanticipated lack of turnover, but a recession seems to be the opportune time to nurture this loyalty. While some staff members are leery of changing to a new environment, others, in whom organizational commitment is marginal, might become more loyal if development programs were instituted. When the economy turns, employee tenure and management support discourage someone from exploring outside the company.

Third, although this study started out as a survey of systems professionals, it soon became apparent that some participants who reported to a systems area in 1977 were actually users in disguise. In 1983 some systems staff had migrated out to user areas. To complicate matters further, they openly admitted their intentions to switch again! Thus the focus was changed to ''systems-related professionals.'' One former user, now a systems analyst but soon to be a user again, stated, ''We won't need systems people in the future.'' Another said, ''The crossover is the way of the future.'' These two may have lacked objectivity, but even those who are exclusively users or dp people hinted that such chameleons are the ideal systems people and users. Is it possible that we might have systems-proficient users and functional systems analysts?

NEW JOB TITLES IN FUTURE

Past and future trends point toward the user area, indicating career paths that will be difficult for a human resources personnel department to manage. It is likely that a variety of titles will proliferate, if the participants' inability to give a 1988 job title is an accurate indicator. Less clear, however, is whether the migration to user areas is a result of the lack of dp career paths. This is a tempting conclusion to make, but other conditions are worth investigating. For example, the high growth need of systems professionals may direct them to functional areas. Most of the participants stressed the importance of having a systems staff that understands the business environment. Users' computer literacy is inevitably growing with the infusion of micros into the office and home. Their heightened interest in the technical sphere and the desire of systems staff to complement their technical base suggests a blur of systems-related professionals. The systems staff and users in this sample urged young people to work in user areas and supplement technical training with business training to become the ideal systems persons.

A likely scenario for the future information resource department is a small technical staff with a core of trainers that users can call on, headed by a vice president of planning and information. Some firms are already promoting such an atmosphere with the use of information centers. One dp manager commented on losing two of his information center staff to user areas, because dp puts their best communicators in the center. Instead of worrying about a loss of power base, the MIS director might plant the best systems analysts in key user areas (an example of internal turnover). This infiltration strategy puts the MIS director in charge of the information resource and proves to the firm that information is a major asset. The crossover trend could lead to the day when all users are systems proficient, and the systems analyst of today is no longer necessary. That would solve the shortage problem without waiting for MIS and CS programs to produce trained technicians.

MIS management should assess the opportunities available for their staff, their users, and themselves. Some firms have encouraged this internal turnover from systems to the user area and vice versa. Perhaps it is too soon to evaluate whether these experiments are successful in filling the gap in skilled personnel. On the other hand, it may be too late to experiment once the staff is lost. In September 1978, DATAMATION carried an article by Jac Fitz-enz, entitled ''Who Is the Dp Professional?'' In 1988 we might walk into a user area and ask, ''Who is the real dp professional?'' ◆

CARTOON BY LEO CULLUM

Kate M. Kaiser is assistant professor, MIS, with the University of Wisconsin-Milwaukee. Prior to this position, she taught MIS at McGill University in Montreal. Dr. Kaiser began her dp career in 1967 as a keypunch operator on second generation equipment at Kent State University.

The PBX is transforming the telecommunications world in Europe.

HOLD THE PHONE

by Paul Tate

From words in waves to data by the bit, the world's telephone systems are undergoing the most radical change in their 100-year history as they make the switch from the analog to the digital domain.

Perhaps the most significant result of that change is the development of the digital private branch exchange (PBX), a highly sophisticated communications processor that functions as a telephone switch. Capable of integrating voice, data, text, and image, the digital PBX can transform an internal telephone system into a strategic communications network at the forefront of a company's operation.

European PBX shipments are expected to total $3.4 billion by 1986, according to researchers at Frost & Sullivan. Hoping to make some of those lucrative shipments are a plethora of computer and communications companies that are scrambling for a foothold in the once-fledgling market. "The European PBX business is certainly heating up," confirms Northern Telecom's vice chairman Basil Beneteau. "It [Europe] may be five years behind the U.S. in the use of digital systems, but the competition is fierce and the markets are opening up." Northern Telecom is in fact one company that's putting its money where its mouth is. To support its European operations, the PBX producer has invested $10.5 million in a U.K. development and production center.

Not everyone would agree with Beneteau's assessment of the European PBX market. Wolfgang Swartz, president of Rolm's international telecom division, calls the market "stifling and restricted. Look at the way the German Bundespost operates as a PTT," he complains. "It tells you what size system you can sell, what the architecture should be, and what services you can offer."

The European PTTs have traditionally maintained tight control over their national telecommunications markets. They've achieved this tight control by dictating technical standards, by imposing marketing strategies, and by using their monopoly positions to foster the growth of the local industry. Some of those protective barriers, however, are now coming down and there is an international rush to get a foot in the door as these markets become more open.

FIG. 1

WEST EUROPEAN PBX MARKETS

	PBX EXT	1982	1986	Total % growth
WEST GERMANY				
Installed	<100	131,670	151,400	15.0
Systems	>100	17,750	20,600	16.0
Shipped	<100	12,360	15,600	26.2
Systems	>100	1,508	1,920	27.3
FRANCE				
Installed	<100	80,122	91,587	14.3
Systems	>100	10,900	12,510	14.8
Shipped	<100	7,080	8,030	13.4
Systems	>100	890	1,025	15.2
U.K.				
Installed	<100	105,700	116,770	10.5
Systems	>100	4,472	4,936	10.4
Shipped	>100	9,470	12,100	27.8
Systems	<100	420	509	21.2
ITALY				
Installed	<100	62,850	70,295	11.8
Systems	>100	3,580	4,060	13.4
Shipped	<100	5,285	5,870	11.1
Systems	>100	275	300	9.1
NORDIC GROUP				
Installed	<100	13,600	16,400	20.6
Systems	>100	4,630	5,780	24.8
Shipped	<100	1,560	2,500	60.3
Systems	>100	460	530	30.5

SOURCE: PACTEL

What has helped unlock that door is the rapid advances in computers and communications—advances that have led to the long-awaited merger of the two technologies. And it's this technological convergence that carries enormous implications for both the industry and the marketplace.

"The convergence is literally redefining the telecommunications industry," declares AT&T chairman Charlie Brown. "We're talking about a whole new range of possibilities for communicating and handling information—possibilities that can enhance the productivity and effectiveness of individuals and businesses."

At the center of that convergence is the PBX, which has also undergone some dramatic changes. "The fact is that nobody is selling a simple PBX anymore," says Olof Lenneman, PBX sales manager for Ericsson Information Systems. "What they are selling is the heart of a complete office system."

THE PBX's PIVOTAL ROLE

The pivotal role the PBX is destined to play in the development of an internal office network has not escaped the notice of dp and telecommunications companies. "The PBX sale should lead to account control," explains Richard Miller of Cimost Inc. "That is one reason why IBM has made such determined efforts to enter the PBX business."

John Hooley of Plessey in the U.K. believes that part of that trend can already be seen in the marketplace. "Five years ago 90% of the value of a PBX sale was in the central system itself. Now that has dropped to 40%, with 15% in maintenance and the other 30% in the supply of terminals and add-on functions."

A closer look at today's PBX market shows why this is happening. Although a number of integrated PBXs are currently on the market, there is still a strong demand for the earlier electronic switches that can also support limited data functions. Users, encouraged by the PTTs, are willing to ditch their old strowger and crossbar switches for new electronic systems, but they don't feel it's necessary to make the quantum leap to a fully integrated exchange.

"It is a very pragmatic approach," comments Arthur D. Little consultant Roger Camrass. "Unless they are sophisticated network users, most people will not change just because there are fully digital switches around. Many people will stay with established electronic PBXs and simply add data functions."

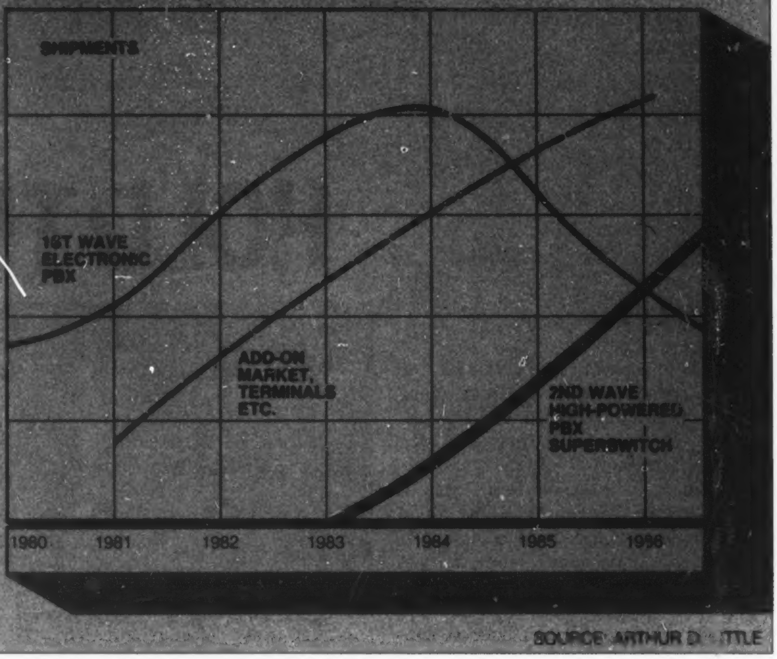
It's also true that 85% of a PBX's work still involves voice traffic, and cost overheads may be incurred in providing sophisticated data handling on only 15% of the lines. As the suppliers push the sale of add-on functions and users fill up existing switch capacity, the need for more functionality in the switch itself increases. That is when the real market for integrated switches will develop, but that's still a few years away.

Vendors, on the other hand, must encourage the use of those terminals and add-on functions to cut down the life cycle of the older switches. That life cycle is already on a downward spiral. Alan Knight, head of Logica's telecom division, estimates that the life span of a PBX has plummeted from 15 years to around seven years.

These dramatic shifts in the structure of the PBX business are fostering increased international competition between suppliers in both the dp and telecommunications industries. In Europe that competition underscores the need for more open markets, markets that allow local users to have access to new technologies. In a recent report on "Communications in Europe," U.K. consulting firm Logica concluded that "there can be no doubt the general trend has been towards liberalization in European markets, and that policy seems set to continue in the same direction for the foreseeable future. The implications are clear enough: there will be increased opportunities for independent suppliers of equipment and services." Logica, however, also believes that "PTT purchasing policies will remain strongly nationalistic and changes are likely to be largely cosmetic."

FIG. 2

PBX MARKET TRENDS



SOURCE: ARTHUR D. LITTLE

Despite their nationalistic tendencies, some European PTTs are becoming more amenable to the idea of buying systems from foreign suppliers, especially for resale. In the U.K., for example, Canadian company Mitel supplies systems to British Telecom. Further north in Sweden, Northern Telecom has a licensing agreement with an arm of Televerket, the local PTT.

PTTS LET OUTSIDERS SELL

More important, the PTTs have displayed increased willingness to let outside companies sell systems directly to end users. And there is obviously no shortage of suppliers who want a piece of that action. Many vendors have been particularly attracted to the U.K. market, where the liberalization of the telecommunications industry is seen as a stimulant to economic growth. Much of that liberalization came as a result of the British Telecommunications Act of 1981, which stripped British Telecom of many of its monopoly powers. On the PBX front, BT's monopoly over small switches under 100 lines was finally curtailed last July. (Larger PBXs have always been available from private industry.)

Nevertheless, British Telecom is still a major factor in the marketplace. BT, which has become more market-driven in the wake of deregulation, maintains a strong PBX line based on GEC, Plessey, and Mitel equipment. Outside suppliers still need to get equipment approval, but only interim authorizations are currently available. The final okay will come from a new independent body, the British Approval Board for Telecommunications, which is being set up to counter allegations that BT could use the approvals process to its own commercial advantage.

Following the same tack, the Deustche Bundespost (DBP) in West Germany has established a separate approvals department, the Zentralamt fur Zulassungen Fernmeldewessen (ZZF). The DBP claims the ZZF is completely independent from its other operations.

The DBP, which labels itself liberal, is still considered to be one of the strongest PTT monopolies in Europe. In the PBX realm, it supplies around 50% of systems, mostly at the low end. Of the indigenous German PBX manufacturers, Siemens is well ahead of the pack, with about 80% of its PBX sales going directly to end users. Nonetheless, the DBP, which controls technical specifications and market prices, remains a stumbling block in that West German marketplace.

SWIFT APPROVAL PROCESS

In France the national PTT, the Direction Générale des Telecommunications (DGT), does not supply any PBXs, and its approval process for equipment from independent suppliers is relatively swift—around a year. There are still problems, however, for outside suppliers. "On paper there are no restrictions to entering the French PBX market," says Roberto Rochio, the director of operations for Olivetti's tele-

FIG. 3

MAIN PBX SUPPLIERS IN WESTERN EUROPE

U.K.
Plessey
GEC/Northern Telecom
Philips/Rockwell
STC Business Systems/ITT
ICL/Mitel
Ferranti/GTE
Thorn Ericsson
Harris
IBM

FRANCE
CIT Alcatel/CGE
Jeumont Schneider
Thomson CSF
CGCT/ITT
Matra
SAT
IBM

WEST GERMANY
Siemens
Telefonbau und Normalzeit (T&N)
Te Ka De/Philips
Standard Elektronic Lorenz/ITT
De Te We (Siemens associate)
IBM
Nixdorf
Ericsson

ITALY
Italtel
FACE/ITT
FATME/Ericsson
GTE
Philips
Telettra
Olivetti/Northern Telecom

communications division Olteco, "but France is a very difficult place to do business."

Philippe Picard, head of the DGT's industry division, feels that such criticism is unjustified. "France does not have a very liberal image, but in fact the market for PBXs is very open and competition is fierce. I think the reason many foreign suppliers are not interested in selling here is that prices in France are around 20% to 25% lower than in Germany, for instance."

The French have done a great deal in recent years to stimulate their telecommunications industry and update their national telephone system. This should finally quiet the critics who claim that half of France is waiting for a telephone, while the other half is waiting for a dial tone.

The passion for nationalization in French industry has resulted in the proposed merger between Thomson-CSF's telecom division and the CGE arm of CIT Alcatel. The Thomson company, which is especially interested in the PBX market, has just launched its Opus 4000 digital PBX. Competing with Thomson is Jeumont Schneider, probably the most significant PBX supplier in France. The firm has over 36,000 systems installed, which represents around 37% of the market.

In contrast to the DGT's hands-off attitude toward PBX sales, Italy's state-controlled telephone body, Societa Italiana per l'Esercizio Telefonica (SIP) is a major player in the Italian marketplace. SIP maintains close links with Italtel, which supplies around 50% of the local PBXs. Elsewhere in Europe, the PTTs' PBX involvement varies. Both Sweden and the Netherlands have strong monopolies in the PBX business, while Spain, Austria, and Belgium take a more liberal view of outside suppliers.

Most PBX vendors in Europe are either local companies or North American firms that harbor hopes of breaking into the market. Obviously, the Europeans have a head start over their transatlantic rivals. One reason is that they understand the different local telecommunications markets. They also do not face the same technical problems that the North Americans do in adapting machines for those markets.

Those technical setbacks, which can be significant, fall into two main categories—Europe-wide standards and national requirements. Northern Telecom's Beneteau comments that in adapting a North American product for the European market, "you find that 70% of the changes are 'core' changes, and the rest depend on which national market you are aiming at."

Logica's Knight says two technical changes are needed for the European market. He explains that while Europe and the U.S. use a 64Kbps transmission speed, the coding laws for converting analog signals into 8-bit computer words are different in Europe. Secondly, the interface between the trunk network and the PBX must be changed, because Europeans use a different method of multiplexing. In Europe the standard is 30 × 64Kbps for a 2Mb bit stream, while in the U.S. 24 × 64Kbps gives a 1.5Mb bit stream.

The design of a PBX clearly affects the ease with which it can be adapted. When European suppliers such as Ericsson design a switch, they make sure it can be adapted to national requirements. North American suppliers are beginning to catch on. An AT&T spokeswoman claims that the company's Dimension 85 PBX has built-in flexibility, having been designed with "international markets in mind."

Coping with the technical problems is one thing. Coping with entrenched competition is another story altogether. Some of the local European suppliers have been content to concentrate on their national markets. Other companies such as Ericsson, Siemens, and Philips have successfully branched out into foreign markets. All three companies have worked through local subsidiaries, distributors, and partners to attack these markets.

TRYING TO BROADEN BASES

Many other European companies are also trying to broaden their domestic bases. The newly formed Thomson-CGE team in France is searching for partners; the U.K.'s Plessey is trying to get Burroughs to incorporate the company's IDX digital exchange into its product line; Nixdorf plans to take its in-house-developed PBX into foreign markets once it has made some headway in Germany; and Olivetti is looking for a digital switch it can add to its foreign product portfolio.

AT&T is also exploring ways to break into the European PBX market. It is keeping its options open, however, and is considering selling its Dimension 85 PBX through PTT and independent supplier channels. The system, which is selling well in Greece, is up for approval in the U.K. and Germany.

AT&T International is playing its European marketing cards very close to its chest. "We are treating the European market with a great deal of respect," explains a company spokeswoman. "We realize that our European competitors have probably forgotten more than we know about how to sell here." The company is anxious to recruit European partners to make up for this lack of experience. Its initial deal with Philips only covers public switching systems. Industry observers feel that the rumored tie-up with Olivetti could help give the company the marketing boost it needs in Europe.

Other North American companies like Northern Telecom and Mitel have had varying degrees of success in Europe. But the main contender from across the ocean still appears to be IBM-Rolm.

IBM certainly has the kind of European marketing presence that could make it a serious contender in the PBX arena. Nevertheless, Ericsson's Lenneman says he is not all that worried about the IBM threat. "On the surface, the IBM and Rolm partnership is very dangerous, but IBM has a serious problem in the PBX market. It has tried to sell its systems for the last 10 years with very little success. The Rolm agreement is almost an admission of this."

Telecom experts don't believe IBM will even bother introducing the Rolm PBX in Europe. Instead, they think the mighty company will get more marketing leverage by linking up with a European PBX supplier.

All this intense competition points to one thing—the importance of the PBX in the overall telecommunications marketplace. Transformed by the convergence of computer and communications technologies, the telephone system is no longer simply a conversation piece, it is the linchpin in tomorrow's telecommunications networks. ◆

OEM/SYSTEMS HOUSE EDITION

Oems and SIs say their hardware spending will increase 29%, with personal computer shipments up 117%.

1984 MARKET FORECAST

by John W. Verity

Judging by the way they perceive their on-hand inventories of minicomputer hardware, oems and systems houses are looking forward to their business picking up substantially in coming months.

After a year of extremely soft pricing, sluggish overall sales, and the encroachment on traditional minicomputer turf by the now ubiquitous microcomputer, oems and systems houses indicate a sharp decline in their inventories, according to a survey taken last summer by Cowen & Co., a Boston research firm, and DATAMATION.

Completed questionnaires from more than 7,700 data processing managers and oems were received. The survey results include reports from more than 6,000 dp sites and 560 oems, systems integrators, and other value-added remarketers.

While inventories for oems and systems houses had grown in previous surveys to 3.5 months in 1982 from 2.6 months in 1979, this year's number was 2.8 months. Breaking the data down further, the survey showed last year's length of supply for oems at 4.0 months dropping to 2.5 months this year. Among systems houses, the drop was to 2.9 from 3.2 months.

In other words, it looks as if the product pipeline will soon be refilled as orders come in and inventories are replenished, according to Cowen analysts.

The shortening of inventories comes mainly from the commercial side of the business which is showing much more activity than technical markets. For instance, those oems and systems houses selling standalone business systems indicated an average of 2.5 months of hardware on hand, while those selling medical/biophysical lab analysis systems said they had about 6.5 months of inventory in-house.

This definite uptick in the expectations of oems and systems houses is a refreshing change from the rather dim sales environment experienced in past years. This group of systems remarketers is apparently losing some of its importance to the minicomputer industry as vendors beef up direct sales forces and move product through new, higher-volume sales channels.

Asked if their organization had canceled or delayed any deliveries of hardware, oems and systems houses also said there was a decrease compared to last year. Only 9.6% of responding oems and systems houses this year, compared to 14.4% last year, said they had already delayed or canceled deliveries. Only 1.1% this year said they expected to do so in the foreseeable future.

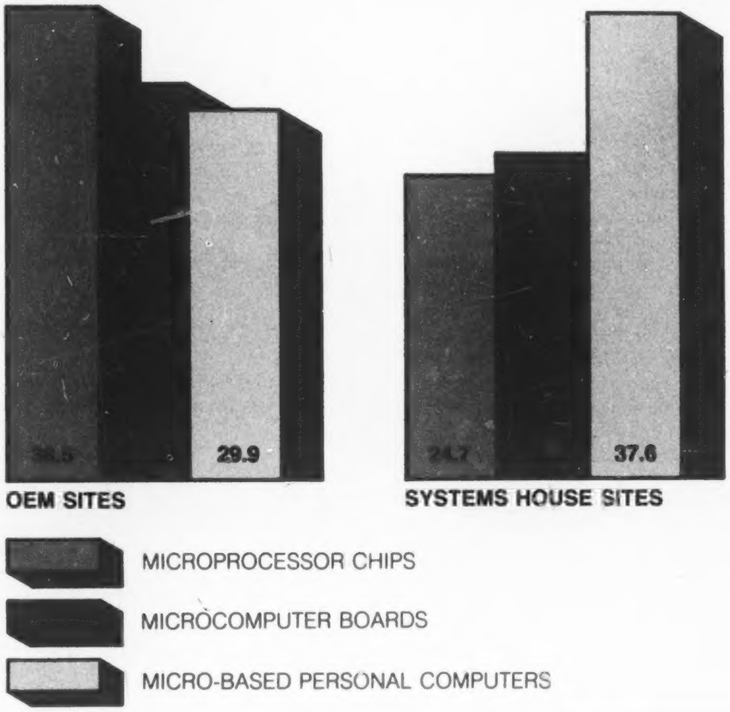
Pricing of minicomputer hardware had been soft in past months, as vendors struggled to stimulate sales. Systems houses and oems each indicated a drop in the number of respondents who indicated that they had received no price discount on the last system they had purchased.

Especially aggressive pricing was indicated by respondents who had purchased equipment from Prime Computer, followed by those doing business with Texas Instruments, Digital Equipment, and Hewlett-Packard.

The survey found that spending for minicomputers would be up 13.9% in 1984 compared to the year before. That rise is up slightly from the 12.5% figure recorded in

FIG. 1

MINICOMPUTER OEM/SYSTEMS HOUSES TURNING TO PCs



CHARTS BY CYNTHIA STODDARD

Oem shipments of PCs will exceed minis, in terms of dollars, in a few years.

last year's survey, but nowhere near the 23.5% growth seen in the 1981 survey.

Most of the acceleration in mini spending is attributable to oems and systems houses, who together indicated their spending would rise by 28.7% through June 1984. End-user buyers indicated only a 10.5% rise in spending.

Of the overall spending on minis, the traditional minicomputers' share is expected to fall while standalone business systems will gain slightly. In a comparison of purchases from July 1982 through June 1983 with expected purchases from July 1983 through June 1984, the numbers work out as follows: traditional minis from 64.7% to 61.5%; small business systems from 22.3% to 24.8%; data entry systems from 6.4% to 6.8%; office systems from 5.3% to 5.6%; and intelligent terminals maintaining a 1.3% share.

MINI SLOWDOWN DUE TO PC

A substantial part of the slowdown in minicomputer purchases can be attributed to the rapid growth in personal computers, which are taking over from shared minis in many applications. As opposed to minicomputer shipments, which will rise only 13.9% in the coming year, the survey finds personal computer shipments will grow by a whopping 117%. Indeed, for the year ending June 1984, the split between minis and PCs in terms of respondents' purchase dollars was 26% to 74%. Hence, the survey analysts suggest that shipments of PCs will exceed the minicomputer in terms of dollars in two to three years.

Spending expectations for 1984-85 are still downbeat among oem respondents but improving for systems house sites. Fully 50% of the oem respondents said their spending for the year ending in June 1985 would be higher than that for the previous year, compared to a similar figure of 54% recorded in last year's survey. Among systems houses, on the other hand, this year's survey found a comparable number, 46% this year, up from 43% last year. Nevertheless, neither figure was up to the forecasts taken in 1981, when oems saw spending rising 62% and systems houses saw it up 57%.

Those applications sectors forecasting the most growth in purchases of minicomputers are manufacturing, retail/wholesale distributors, and government.

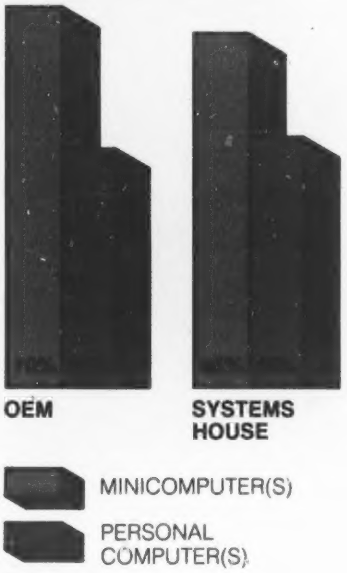
In the all-important 32-bit minicomputer market, Digital Equipment's share is still the largest, at about 67% of survey respondents, but its growth in the market is leveling off. Data General, with its MV series of machines, appears to be gaining market share, particularly as its high-end MV/10000 competes vigorously with DEC's aging VAX-11/780. Data General's share of the respondents' 32-bit purchases will grow to an expected 10.3% in the 18 months ending December 1984 from 6.4% in the year ended June 1983.

Six years after its introduction, the VAX-11/780 makes up 68% of respondents' total VAX purchase dollars, compared to 27.2% for the model 11/750 and only 3.4% for the 11/730. The question DEC must be facing, therefore, is how much impact will its upcoming VAX models have on the installed base?

Among DEC minicomputer sites, fully 85% of purchase dollars will go to 32-bit systems in the 18-month period ending December 1984, compared to 61% in the similar period ended in June 1983. For Data General sites, however, the growth will be even greater, moving from 29.2% for 32-bit machines in the first time period to 57.6% in the latter 18 months. For DEC, of course, this means the migration of its user base from 16-bit to 32-bit systems will be over in a few years while Data General appears to have a longer migration period to look forward to.

FIG. 2

PERCENT OF MINICOMPUTER USERS PURCHASING PCs



Prime Computer's big seller has been the model 750, which in the 18 months preceding July 1983 captured 40.7% of respondents' Prime purchase dollars and 33.6% of their unit volume. Looking ahead 18 months, however, Prime users indicated they would be boosting their share of dollars going for Prime 2250 machines to 26.9% from 3.5%, compared to the 750's slipping to 32.8% from 40.7%. The model 850, too, looks as if it will slip to 12% from 25.1% of dollars spent.

IBM, DEC LEAD DDP MARKET

In another subdivision of the mini market, distributed processing, IBM and DEC are clearly the winners. Together they will capture half the ddp business planned by survey respondents: IBM with 42% and DEC with 18%. Datapoint, on the other hand, is losing market share swiftly, dropping to a 1.1% share of planned expenditures.

In the operating systems arena, particular attention was paid to AT&T's Unix package, which has been gaining steam in recent months but which has yet to dominate the marketplace. So far, its usage among survey respondents is limited largely to users of DEC machines. About 68% of the Unix users surveyed were running DEC equipment, followed by 4.3% running IBM systems, and 3.2% each for Data General and Hewlett-Packard. Among those planning to install Unix some time in the 18 months ending in December 1984, the highest growth was seen among IBM and HP sites.

Out of the total survey population, only 4.1% were using Unix at the time of the survey, but some 15% said they planned to install it in the coming 18 months. The outcome of that migration may mean, of course, that DEC's VMS and other proprietary operating systems will suffer as Unix use spreads through minicomputer sites and its spin-offs such as Xenix find acceptance in the personal computer marketplace.

Unix's penetration of the marketplace will be particularly strong in DEC, Perkin-Elmer, and Gould/SEL sites, followed by sites running hardware from Harris, Prime, and even NCR machines. And, of course, Western Electric's own line of Unix-based minicomputers is becoming a factor in the mini marketplace, although in this survey the machines were in use solely within the Bell System.

Unix's penetration of various industry sectors showed particular strength in education, where the operating system was nurtured for many years, and in military/aerospace and scientific/engineering sites. At the bottom of the list, as might be expected, were office systems and business data processing, where Unix has yet to make a significant penetration.

The minicomputer's battle with the personal computer appears to be a losing one in some respects, but more oems and systems houses indicated they were planning to pur-

The Unix operating system will be adopted by 15% of dp managers over the next year.

chase minis than personal computers in the year ending June 1984. Fully 70% of the oems responding said they would be purchasing minis while only 44% of those said they would purchase personal machines. Among systems houses, 65% planned to buy minis compared with 46% buying personal computers. The moral of the story is that oems and systems houses continue to be a major factor in the minicomputer marketplace, adding value and service to otherwise raw machines and helping customers by providing industry-specific solutions to their problems.

Nevertheless, about two fifths of the oem site respondents said they buy microprocessor chips, 32% said they buy microcomputer boards, and 29.9% said they buy personal computers. Among systems houses only a quarter of the sites buy microprocessor chips, 26% buy boards, and 37.6% buy personal computers. Intel again leads the microprocessor purchases of survey respondents, capturing 47% of the chips purchased through June 1983. It is followed by Motorola with a 33% share and Zilog with a 14.7% share..

That ranking promises to remain the same, although Intel's share of unit purchases will rise to 52.8%, Motorola will drop to 26%, and Zilog will go up to 18.1% in the year ending December 1984. Intel's strength comes primarily from the 8088 chip, chosen by IBM for its popular line of personal computers, while Motorola's sales are with the 68000.

In the personal computer marketplace, software availability is still by far the most important criterion for choosing a machine, according to the survey. It ranked tops with 63.8% of total mentions compared to 48% for compatibility, 41% for price, and 41% again for product reputation. Such items as ease of learning, graphics capability, and disk capacity were least mentioned by end users. The point here appears to be that IBM's dominance in capturing newcomers to the corporate personal computer marketplace makes it necessary for others to offer some kind of software compatibility in order to take advantage of the large numbers of software authors aiming their efforts at the IBM machine.

"Be on your guard. It turns out this is some sort of fund-raising event."

CARTOON BY SIDNEY HARRIS

No doubt IBM's reputation has helped it sell its P.C., a fact reflected in the survey's finding that IBM is particularly strong among large corporations where centralized purchasing is the norm. But shelf space at retail outlets remains important for IBM and Apple in particular. While DEC and HP personal computers seem to be purchased more often directly from the manufacturer, IBM and Apple systems were cited as being bought predominantly at independent stores.

VAX-11/780 HEADS MINI LIST

Heading the list of the top 10 minicomputer systems for the 18 months ending July 1983 was the DEC VAX-11/780, in terms of the number of survey respondents acquiring it. Out of just over 7,000 total respondents, 292 sites acquired VAC-11/780s (an average of 1.6 machines per site), followed by the VAX-11/750 and two other DEC machines, the PDP-11/23 and 11/44.

In terms of number of units being acquired by respondents, IBM's Series/1 once again topped the list. Respondents indicated they had acquired 1,501 units at an estimated purchase value of $86.8 million. This is the fourth time in this annual survey that IBM's Series/1 mini has been number one. It was followed by DEC PDP-11 machines of various models and the General Automation 16/2XX series.

Projections through the end of 1984 indicate that the top minicomputer in terms of respondents' stated acquisitions is again the VAX-11/780, which is to be acquired by 247 sites. It is followed by the IBM System/36 (to be acquired by 195 sites) and the VAX-11/750. In terms of number of units to be acquired, the IBM Series/1 is once again on top. Respondents said they planned to acquire 961 of those machines, at an estimated value of $41.2 million. The next system on the list is the Microdata Reality 4000, of which 540 units will be acquired at a total value of $13.5 million. Respondents to the survey also said they would acquire a total of $132.2 million worth of VAX-11/780 machines and 48 Data General MV/10000 systems worth $14 million.

The IBM System/36 is clearly the winner in the minicomputer market, taking advantage of the tens of thousands of System/34 machines already installed. IBM appears set for a meteoric growth with that new machine.

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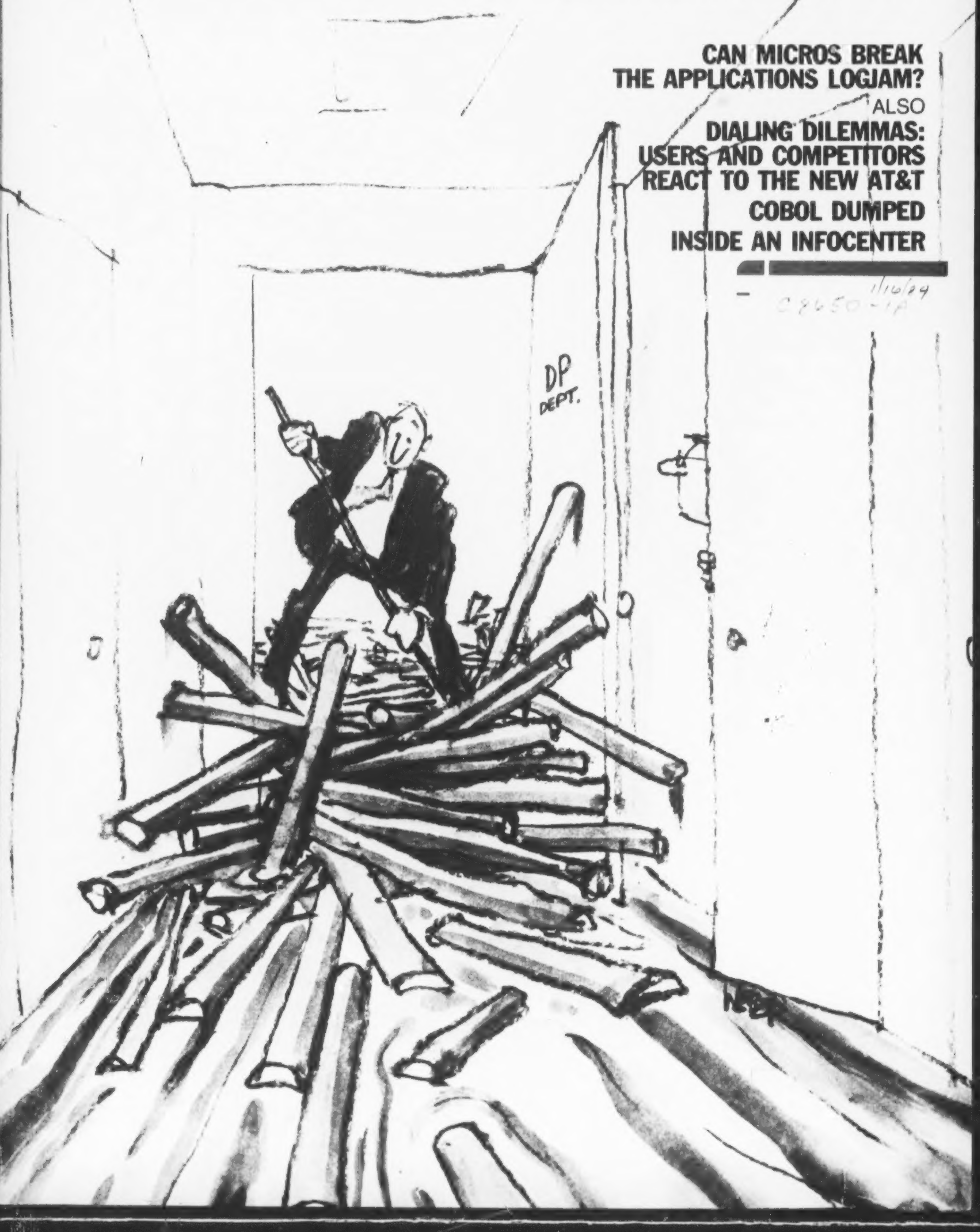

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COVER ILLUSTRATION BY BOB WEBER

The world is shrinking, not from geology, but technology.

GOING GLOBAL WITH WORLDWIDE NETWORKS

by Paul Tate

In case you hadn't noticed, the world is getting smaller. You won't feel the earth shrinking under your feet, because the change is due to technology, not geology. This global contraction is a result of developments in international communications techniques that render established conceptions of distance obsolete.

This latter-day continental drift is accelerating as global telecommunications and information networks become more sophisticated and widespread. Advances in digital transmission and switching technologies allow these networks to be used more readily for transmission of data, text, and images.

At the same time, increased use of communications satellites and high-capacity terrestrial and undersea cables are making international networking more viable. Worldwide networks are already vital life-lines for organizations involved in international finance, transportation, and commerce. And, as the networks expand so does the number of users.

Going global is not such a big deal anymore. International communications links are sufficiently extensive, in the developed world at least, to allow manufacturing and assembly to be done where it is most economical. They are also reliable enough to permit corporate information to be stored where it is most convenient. Thus, overall control of the operation is as effective across continents as it is across an office corridor.

What we are talking about here is an expansion of world trade, in which global communications networks play an increasingly important role. "World trade and telecommunications have developed along similar lines," contends Siemens president Karlheinz Kaske. "In 1980 the flow of goods and information in world trade accounted for 23% of global GNP. This is expected to rise to 30% by 1990, and the expansion will be made possible by the simultaneous availability of information thousands of kilometers apart—thanks to the telephone, text, and data communications. International telephone traffic alone is increasing at an annual rate of 15%, and the growth in text and data traffic is at least as fast."

But not as fast as the predictions in the '70s suggested, according to David Lawrence, general manager of business development at Cable & Wireless in the U.K. "The pundits said that data would outstrip voice communications by the mid '80s, but it is nothing like that. The growth of international data communications has fallen far short of expectations."

Lawrence admits that there have been significant increases in the volume of data traffic for applications like database access, particularly to the U.S. When it comes to bulk data transmission, however, "it is still cheaper to put a mag tape on a plane than to pay for a 2Mb link," he explains.

GLOBAL NETWORK PROBLEM

Cost is only one of the thorns in the side of a budding multinational. Despite the considerable advances already made in international networking, global nets still face global problems. Current trends in worldwide communications systems are, in fact, aimed at overcoming the remaining technological, economic, and political obstacles.

From a technological point of view, these networks will provide greater global coverage, offering increased communications capacity to meet the rising demands of international organizations and enhanced ease of use. This user friendliness will evolve as the various national systems become more compatible to each other.

First problem: the only two communications networks that come anywhere near being global are the telephone and telex nets. Even these, however, do not cover the world with any degree of uniformity. For example, 90% of the world's 550 million telephones are installed in 15% of the countries—an imbalance that reflects economic concentration. While these networks carry data and text, they are not really designed to support the wide range of information-based services now being demanded by businesses.

In addition to the basic telephone network, there are numerous specialized data networks that have emerged, mostly in the developed nations. First there are the circuit-switched networks like Datex-L in Germany and the Nordic Public Data Network. Then there are the packet-switched networks like Transpac in France, Packet Switchstream in the U.K., and the pan-European Euronet network. The circuit- and packet-switched systems, which offer international gateways to users, have carried much of the recent global data traffic. As the PTTs increase the number of gateways to foreign networks, this traffic is expected to increase.

Yet, there is still a considerable amount of incompatibility among these specialized systems and the way in which they are implemented in various countries. In packet switching, for example, the national PTTs have implemented so many different options under the X.25 umbrella that another, more rigid standard, X.75, had to be introduced. This standard for international packet-switching gateways allows the various national systems to talk to each other.

Hans Baur, head of Siemens' public communications division, complains that "practically no globally open networks using packet switching and circuit switching have yet evolved." And that's mainly because the demand simply hasn't been there. It will be soon though, according to Baur, who predicts "a worldwide spread of data networks within the next few years."

The PTTs' creation of incompatible data networks has been the subject of much debate in the European Commission. Last September a Commission report severely criticized the PTTs' go-it-alone policy. It went on to recommend that European telecommunications networks be harmonized before the various implementations become too entrenched. The report calls for expedited agreement on interface standards on the European networks and for the joint development of more international communications links by the PTTs.

Many PTTs are planning on updating their analog-based phone networks. This transition into the digital domain should help the harmonization effort, as long as common standards are adopted, that is. The switch to digital, however, will take a long time, since the PTTs have an enormous investment in existing plant. Replacing them will stretch their capital resources to the limit.

"The past is still with us, especially in countries endowed with large plant and installations," notes Jacques Darmon, manager of Thomson-CSF's communication arm. (The worldwide investment in telephone plant is estimated to be around $500 billion.) Darmon foresees the difficulties that many countries will face in upgrading their telecom equipment: "The present system simply can't be abolished. Telecommunications systems cannot be replaced like automobiles."

The development of digital switching systems is not only causing widespread changes in national telephone networks, but it is also trimming down the number of suppliers of public switches. Over the last 18 months the following developments in Europe served to highlight this supplier trend: in the Netherlands, Philips ditched plans to develop its PRX-D switch and began looking for ways to fill the gap with the AT&T ESS system; in France, Thomson-CSF and CGE announced plans to merge their operations; in the U.K., Standard Telephones & Cable left the System X development team; in Switzerland, the PTT has abandoned the idea of developing its own digital public switch with Siemens and Hasler; and in Italy, Italtel has signed a joint venture agreement with GTE.

Two main reasons motivated most of these moves—a shortage of technical expertise and the high cost of development. LM Ericsson, for example, has spent $500 million to date on developing its Axe digital public switch. The market is there, however, and as the PTTs continue to introduce digital systems the remaining suppliers should be able to make a healthy return on their investment over the next decade.

NATIONAL DIGITAL NETWORKS

The national digital networks being put together by the PTTs will allow end users to tap into a whole new range of datacom services. These future nets will integrate voice and data on the same line and make access to the network simple for all forms of communications. That, in

A NEW ORBIT FOR SATELLITES

Ever since Early Bird bleeped its way to world fame in the '60s, the communications satellite business has been going up and up.

Traditionally supporting telephone, tv broadcasting, and some data transmission, communications satellites are now orbiting into a new service realm. Launching them into that realm are recent advances in digital communications and space technology, which allow a whole new range of business-oriented services to be offered. These down-to-earth services include high-speed data transmission, electronic mail, facsimile links, and videoconferencing.

What's more, there will be a massive expansion in satellite capacity as numerous bigger birds rocket into space over the next five years. The number of international satellite circuits is expected to almost double from 36,000 in 1983 to around 66,000 by 1988.

That's a lot of capacity, perhaps too much for what is still a young and relatively unquantifiable market. Yet, it's clear that the demand for satellites that function as international gateways and adjuncts to national communications networks is growing rapidly.

The worldwide interest in satellite communications is reflected by the popularity of the international satellite body Intelsat, which now has 109 member nations. (Intelsat also leases satellite capacity to 40 other countries.) This year Intelsat plans to offer a business communications service, which will enable organizations to establish their own international networks for voice and data. It is also switching to digital transmission technology. In fact, the Intelsat V-A satellite scheduled for takeoff this year and the future Intelsat VI will both use time division multiple access (TDMA) digital modulation techniques.

Over the next few years, Europe plans to launch a whole squadron of satellites. The European satellite organization Eutelsat, which launched its first bird, the Orbital Test Satellite OTS, in 1978, put its second satellite into orbit last year. Called the European Communications Satellite, ECS-1, it will offer the European PTTs pan-European services for telephony and tv broadcasting, and data transmission to large dish aerials. The ECS-2, the second satellite in the ECS series, will go up this year. It will provide a new business service called Satellite Multi-Service (SMS), which offers 64Kbps to 2Mbps rates for data, test, voice, and image. The service will be accessible via small dish aerials measuring 5 meters to 7 meters. A larger capacity satellite, L-Sat, which will also support SMS, is currently under development.

While Eutelsat seems eager to get its business service under way, it was in fact the French who prompted the addition of SMS to the ECS plans. France intends to send off its own satellite, Telecom 1, at the beginning of this year. Telecom 1 has been specifically designed to offer information-based services. The commercial services, which will use five transponders, will be accessible from 3.5-meter dishes. France is leasing some of the satellite's capacity to other PTTs such as the German Bundespost. The ECS SMS service will also use part of Telecom 1's capacity.

The French have decided to offer basic data transmission on leased lines to users. The basic subscriber services, which are also available to closed user groups, include low-speed (2.4Kbps), medium-speed (64Kbps), and high-speed (2Mbps) data transmission rates.

The U.K. PTT, British Telecom, is also planning to launch its own satellite, Unisat, which will leave the launch pad in 1986. It will also support an SMS-type service known as SatStream. In the meantime, it will offer SatStream service in Europe via the ECS-2 and Telecom satellites, and in North America via Intelsat and various carrier agreements.

West Germany is also developing a national satellite called DFS, which will be in outer space by 1987. In the same year, Sweden, which has gone its own way following the postponement of the Scandinavian Nordsat satellite launch, plans to put its Tele-X bird into orbit. Italy will also test its wings with the Italsat satellite in 1986, but full operation isn't expected until 1990. Each of these national satellites will support SMS-type business services.

Other nations throughout the world have also entered the satellite race. The Arab nations have teamed up to develop their own satellite Arabsat. The first version, offering a range of commercial services, is scheduled to go up this year.

Japan orbited its first communications satellite, the CS-2a, last January. This put the nation nine years behind Canada, which was the first country in the world to launch a communications satellite. The CS-2a, also known as Sakura-2a, will provide datacom, high-speed fax, and video conferencing services to Japanese businesses. The next satellite, the CS-3, is scheduled to be sent aloft during fiscal 1987.

Thousands of miles south of Japan, Australia is also getting up to speed in the satellite race. AUSSAT, the country's hotly debated state-owned satellite company, expects to send off two birds by July or August of 1985. A third satellite is slated to be launched about two years later. Australian businesses will be able to use the satellites for some telecom traffic, including data transfer.

Don't let all this activity fool you, however. Right now the market for satellite communications is still limited. While more capacity and a wider variety of services may encourage usage, the size of future demand is still very much up in the air. **—P.T.**

fact, is what the Integrated Services Digital Networks (ISDN) is all about. And it is hoped that the adoption of international standards for ISDN will help increase the compatibility among the various types of networks now in existence. At least it will make accessing the different networks easier. The plan is to have circuit-switched, packet-switched, and non-switched networks all accessible through a local ISDN exchange. Eventually even the different networks themselves will be integrated, or so the theory goes.

''As a result of international cooperation and standards, ISDNs will be able to offer universal interfaces and service features for worldwide communications,'' according to AT&T's Irwin Dorros.

Dorros is nevertheless realistic about how the theory will be put into practice: ''It does not mean that all the ISDN aspects will be the same from one region or country to the next, or even among competing carriers in the same country. However, the basic methods for accessing and utilizing ISDNs should be the same worldwide.''

While certainly a step in the right direction, the ISDN concept will still take many years to implement. Even in the more advanced countries, ISDN probably won't become a reality before the 1990s.

In the meantime, companies will have to find ways of dealing with the public network problems. Many companies have found the solution in-house. ''More and more customers are doing their own thing,'' points out Cable & Wireless's Lawrence. ''They are setting up their own corporate networks, which cuts costs, gives them more control, more security over the information being transmitted, and better use of their existing equipment.''

Private networks are already a well-established method of international communications in many areas of world trade, travel, shipping, and finance. For example, the SWIFT (Society for Worldwide Interbank Financial Telecommunications) international banking network, which handles much of the payments information among 1,104 banks in 52 countries, has been in operation since 1976. SWIFT's U.K. manager Barry York believes SWIFT has helped transform international banking by fostering cooperation and standardizing payment mechanisms. ''The very existence of SWIFT has made it easier for banks to automate their international operations,'' he maintains.

To set up a network such as SWIFT or any other global system for that matter, you need to have the right links in the right places. This is where satellites can be a big boon to international communications systems. ''The major characteristic of satellite communications systems,'' explains Nippon Electric chairman Koji Kabayashi, ''is its ability to offer high-quality wideband transmission to a vast area regardless of surface distances or natural obstacles. That makes it possible to construct a global communications network quickly and economically.''

FIG. 1

INTERNATIONAL CABLE CAPACITY*

Europe—North America	11,000
Europe—South America	3,000
Europe—South Africa	360
North America—Australia/NZ	1,500
India—Malaysia	500
Malaysia—Japan	2,000
Japan—North America	1,000
Southern Europe—Eastern Mediterranean	2,000

*In channels

Source: U.K. Department of Trade and Industry.

The satellite population is expected to skyrocket over the next few years, doubling the current number of international communications circuits and providing a whole new range of transmission services for commercial voice and data applications (see box).

Terrestrial and undersea cable capacity is also increasing. The Sea-Me-We Venture, one of the most ambitious undersea cable projects, will provide 1,200 circuits from Southeast Asia to the Middle East and 2,400 circuits from there to Europe.

EXPANDED CABLE CAPACITY

Fiber optic techniques have also expanded cable capacity. One hair-thin strand of glass in a fiber optic cable can handle 100,000 phone calls simultaneously. Fiber optic cables are now being planned for use in international links. The first underocean cable will be laid between Europe and North America in 1987.

Wiring the world can prove beneficial to developing nations as well. By getting access to some of the information on these networks, developing countries can play a bigger role on the international trade scene—a role that will enable them to boost their own economies.

While the technical constraints are slowly being dealt with, there are other, more ominous obstacles that must still be overcome in setting up those new global trade routes. Those obstacles come in the form of policies—national transborder dataflow (TDF) policies that could have serious implications for countries and companies using worldwide data transmission systems.

More and more countries are cracking down on the flow of information across their borders. If the restrictions on dataflow become too severe, the whole question of international networks becomes moot. One person who sees the danger is Cable & Wireless's Lawrence, who warns, ''The new trade routes in information must be kept as open and free as the seas used to be.'' ◆

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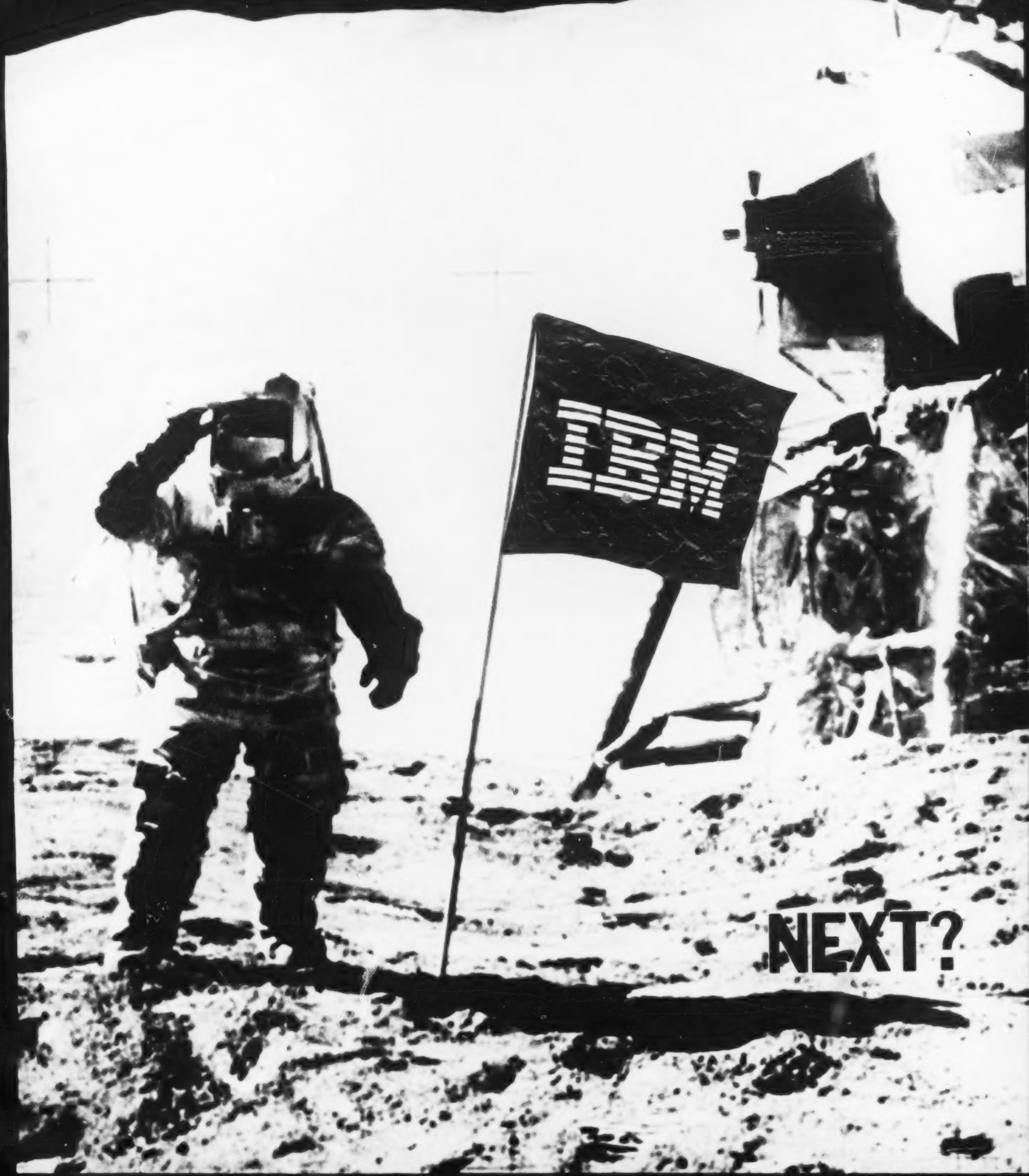

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ILLUSTRATION OF FLAG BY CHUCK SCHMIDT

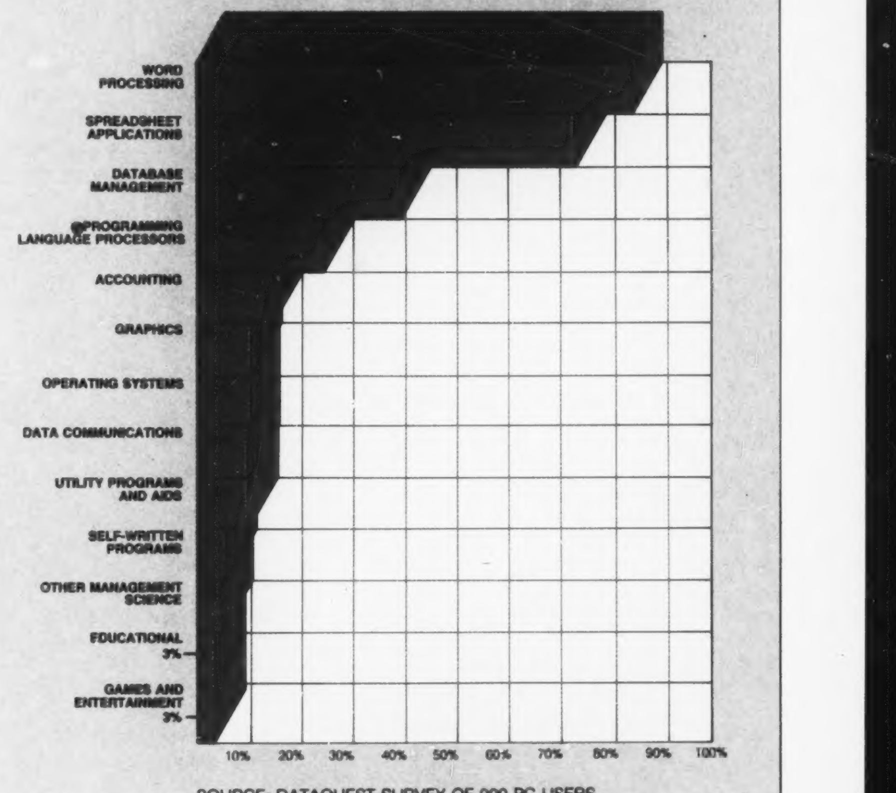
Communications, true user friendliness, and software integration are crucial for the professional workstation package.

THE WORKSTATION MARKET GAMBLE

by Alexander Stein

FIG. 1

MOST COMMON WORKPLACE APPLICATIONS
(PERCENT OF ALL RESPONDENTS INDICATING SOME USE OF EACH APPLICATION)



SOURCE: DATAQUEST SURVEY OF 900 PC USERS

The growing number of systems touted as professional workstations has raised several issues on the nature of managerial microcomputer use. First and foremost is the issue of market definition. Despite numerous articles and reports on professional personal computer requirements, there has been little agreement on a set of criteria for the professional workstation.

A second critical issue, which is clearly related to this problem of product definition, is the apparent resistance of many professionals to using non-telephone-based electronic equipment. For many potential buyers, the use of a personal computer contradicts the stereotype of a strong, influential manager; up to now, personal computer use has generally been relegated to supervisory and secretarial levels in the organization.

To better meet the professional's requirements, workstations must be designed to adapt easily and effectively to the user's work habits, not the other way around. Knowing how PCs are being used by professionals is an important first step to designing a workstation for them. Given the potential market—$8.7 billion will be spent on professional/business personal computers this year, or about half of the total $17.8 billion expected to be spent overall for desktop products—close attention to what the users want is important.

A recently completed survey of 900 personal computer users in the home and work place has yielded extensive information on use patterns, purchase habits, and purchase intentions. Not surprisingly, the professional employs his or her personal computer primarily for word processing and spreadsheet applications. Approximately 85% of business personal computer users regularly sit down at a keyboard and work on a memo or letter with the assistance of a word processing package. This is the most popular application, not, as widely assumed, the spreadsheet; it is regularly used by 74% of users. Database management software was listed as the third most commonly used package, with 40% of the respondents acknowledging a significant amount of time spent with such packages. Other typical managerial activities, such as graphics development and data communications, are significantly less important to these business personal computer operators.

These use patterns contradict most of the conventional wisdom held by some hardware and software designers, original equipment manufacturers, and value-added resellers. Professionals spend more time using a keyboard for word processing than previously thought, for example, indicating that the awkward keyboards on some purported workstations will be a problem. Also, the integra-

CHARTS BY CYNTHIA STODDARD

tion concept cannot be underestimated.

The manager professional typically spends nearly 20% of his or her day on the telephone and another 30% generating verbal and numerical documents, including charts and graphs. The equipment used to produce this output—the personal computer, telephone, pencil and paper—address these needs on an individualized basis, but writing, calculating, graphing, and communicating are not discrete activities. Indeed, they are normally conducted in tandem, and together enhance the overall productivity of the professional. Hence, integration of functions and features is of critical importance.

DESKTOP MACHINES PREVAIL

And unlike what others may have said or thought, use patterns point increasingly toward further reliance on desktop machines. More than 55% of those surveyed said they used their systems for longer than eight hours a week, on average; 38% said they used the system more than 16 hours a week, or *more than three hours a day*. That's why furniture, keyboards, and other ergonomic concerns are so popular.

The need for integrated software packages is also clear—more than 80% of the users report owning more than four software packages. The evidence reports a growing "personal computer dependence" among current users, especially if a more conducive workstation is available.

So what is a true professional workstation? A professional workstation calls for the integration of many of the diverse capabilities currently touted by manufacturers. Few offer all the pieces in one place at a price that does not threaten the budget of a Fortune 500 company, though. The capabilities of a true workstation fall into three broad categories: integrated applications software, user-friendly interfaces, and full communications capability.

Application integration is increasingly becoming a requirement for all but the low-end personal computers for under $2,000. One package combining a spreadsheet, word processing, and data file management in a multiwindow environment is part of the integrated software required for a professional workstation.

In the future, integrated software will incorporate many of the best features of the 1-2-3 package from Lotus development Corp. and the windows of Quarterdeck's DesQ or APX's Applications Executive package. These supersoftware packages will offer full integration, complete transparency, and multiwindowing, and will permit the user to access information from numerous sources for insertion in a single document.

User-friendly, man-machine interfaces currently appear in a number of forms. Xerox and Apple are apparently committed to the mouse, while Hewlett-Packard clearly favors the touch screen. A logical next step is voice recognition (VR) and emulation technology, which several semiconductor manufacturers, including Texas Instruments, have been exploring for some time (Oct., p. 181). Currently available VR workstations are generally limited to an under-200 word vocabulary, but efforts are under way to expand these capabilities to several thousand words.

Communications capabilities are receiving a great deal of attention from both manufacturers and users. IBM's recent introduction of the PC XT, PC 370, and the 3270 PC underscore IBM's commitment to integration of the Personal Computer into existing larger IBM shops. The anticipated introduction of an IBM PC networking product will serve to further the cause of communications integration.

Another area of communications integration is highlighted by the introduction of Rolm's Cypress system and the VoiceStation workstation from Sydis. Both products reflect early efforts to integrate telephony with personal computer applications.

A southern California company, Santa Barbara Development Laboratories Inc., will soon introduce many of the key features in a desktop package. The SBDL Executive System incorporates all of the features currently standard on personal computers along with advanced communications and "electronic secretary" applications.

The system has three components: an executive console, a secretarial console, and a desk-side data storage unit. The secretarial workstation is directly linked to the executive console and features a dual-screen-system for viewing applications running simultaneously. An icon-based touch screen design eliminates the executive keyboard interface problem. Also available are touch screen telephony, electronic mail, and teleconferencing for communications with other units through standard telephone lines. An interesting option, the executive touch screen, controls a robot holding the video camera during the teleconferences.

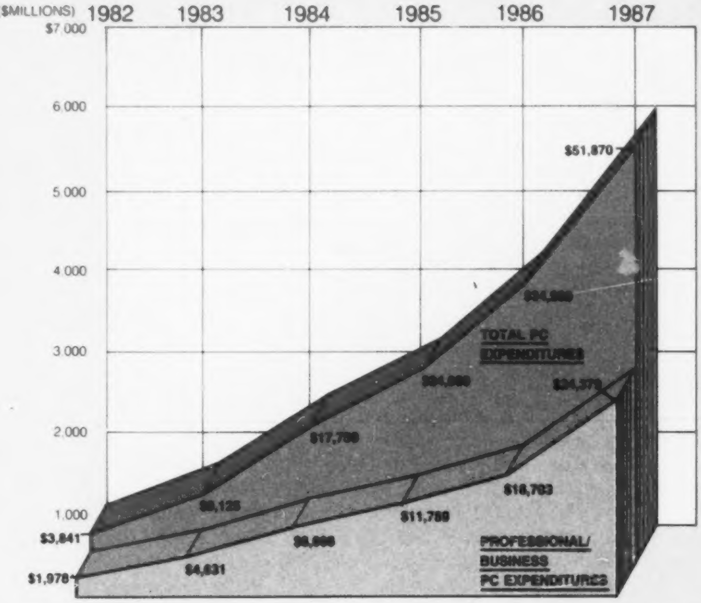
VARIED SOFTWARE FEATURES

Software features of the SBDL system include database management capabilities for text and graphics development and storage, personal calendaring and scheduling functions, with intra-office and remote access capabilities, and standard personal computer work processing and spreadsheet applications that can be accessed via the touch screen or through a standard keyboard. At a price of $25,000 and up for a typical configuration, the Executive System is not for everyone. But it does provide an alternative for the high-level executive who is seeking computing power for his or her daily activities.

The Executive System from SBDL is but one vendor's solution to the nagging

FIG. 2

PERSONAL COMPUTER* EXPENDITURES WORLDWIDE 1982-1987



* SYSTEMS SELLING FOR $1,000-$5,000 IN TYPICAL SINGLE-USER CONFIGURATION
SOURCE: DATAQUEST

Most users say they spend more than eight hours a week with a machine.

problem of limited personal computer acceptance among professionals. At the same time, an increasing dependence on workstations among initiated users, and the specialized nature of many of these environments, has led to the growing importance of value-added remarketers and other middlemen.

For example, the Financial System Plus from Automatic Data Processing, Clifton, N.J., illustrates this trend. The remote timesharing service for bankers, stockbrokers, and other financial industry professionals now offers a combination of database and local computing package. Market data on 38,000 stocks, bonds, commodities, and options, and a business database with historical information on thousands of companies, are integrated with word processing, the Multiplan electronic spreadsheets, business graphics, local data processing, and public datacom networks.

The new system is built around Convergent Technology's N-GEN, a 16-bit microcomputer. It is designed to provide the broker, analyst, or other professional with a wide range of customer-specific and general market information in a flexible, manageable format.

ADP's major considerations in selecting the N-GEN included a fast microprocessor, the Intel 80186, for quick response time between screens; up to 1 megabyte of internal RAM—sufficient for even the most extended integrated software; a high-resolution, 15-inch screen capable of displaying detailed business graphics; a small, modular footprint design with an optional detached 10MB Winchester hard disk; and optional MS/DOS compatibility to run the vast library of IBM P.C. software.

With 50 data centers worldwide, ADP is in a unique position to offer a diversified financial information program. The new package comprises an extended list of services, ranging from the traditional stock price "ticker" to a sophisticated electronic mail messaging system. Not only does the financial professional have access to a wide range of up-to-date financial data, he or she can also exchange high-priority information with other principals. A variety of custom-tailored programming options is also available.

While ADP may be an unusual VAR in an unusual market, the new package includes the attributes considered critical for success in the professional workstation market. First, there is a strong understanding of the user's business and information requirements. ADP/CT designed a flexible hardware configuration, tailoring the system to individual user environments. In addition, ADP had a large staff for the extensive custom programming necessary for the level of functionality and user friendliness expected of a professional workstation. And last but not least, ADP has a highly responsive support and maintenance capability.

To sell a professional workstation system successfully, the oem must also possess one additional attribute: extensive knowledge of how the professional does his or her job. This requires an intimate awareness of the user's goals, procedures, and tasks. Only with this expertise is it possible to develop a truly productive professional workstation system. ◆

Alexander D. Stein is a senior industry analyst with Dataquest, a San Jose, Calif.–based consulting and market research firm. Before joining Dataquest, Stein was manager of marketing services for Saving Inc. and an analyst for Hazeltine Corp.

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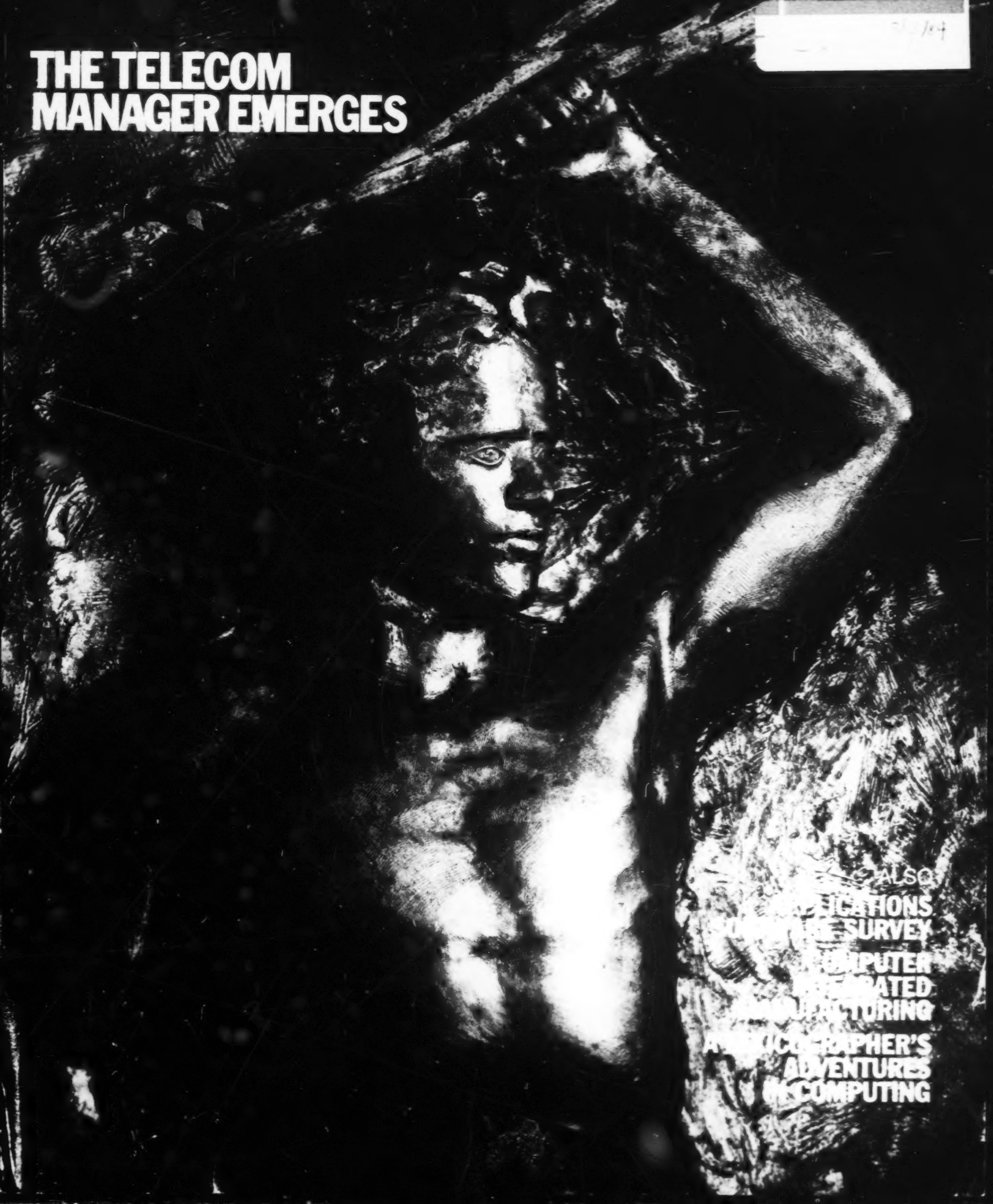

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COVER SCULPTURE BY GERALD SICILIANO
PHOTOGRAPH BY ROBERTO BROSAN

Three thousand users react to the pluses and minuses of 82 packages.

APPLICATIONS SOFTWARE SURVEY

by Data Decisions

Is it easier to produce a good software product than to support one? Probably not, but for some reason applications software vendors are doing a better job providing users with the packages they need than with the backup they want, according to 3,376 users responding to a survey asking them to rate 82 mainframe and minicomputer software packages from 45 vendors. Although 73% of the users gave the packages an overall satisfaction rating of 6 or higher, on an ascending scale of 1 to 10, only 60% gave their vendors' service efforts equally high marks.

Why is this? The difference probably stems from two basic facts of computer software life: not every bug can be found, let alone fixed, before the package is first released, and, understanding how to use a package and conveying this information to others are two different things.

These factors are of special importance for this study, since applications packages are frequently used by nontechnical end users who may need more support than dp professionals. Indeed, a full 51% of those returning the questionnaires were end users, and most of this group did not depend on the dp department for access to the system.

The survey probed user impressions on package performance, vendor support, and value. To determine the dp environment, users identified the hardware and length of time the software package had been operating and provided a detailed profile of how they decided which packages to buy (see Methodology, p. 206).

For the sake of convenience, the 82 packages were divided into seven broad group headings: 21 general accounting packages, nine payroll packages, 15 general business packages, 20 banking and financial packages, four insurance packages, seven manufacturing packages, and six project management packages. Deciding where a particular software product belonged was of necessity somewhat arbitrary; indeed, the general business category is a catchall for a variety of forecasting models, graphics packages, and other types of decision support applications. The main function of the group averages included in the report is to show how one type of product compares to another—it would not necessarily be valid to make direct product-to-product comparisons.

The specific ratings show users indicated that the average applications software package performed okay, but not spectacularly. On a scale of 1 to 10, with the highest

PHOTOGRAPHS BY STEVE COOPER

Whether you're buying a car, a tomato, or a sofa, a customer always wants the best value.

number for a perfect performance, the average package scored a 6.6. Users rated performance from several viewpoints: efficiency of hardware utilization, level of program errors, and the amount of time for initial installation. (A graphic representation of the ratings of 80 packages follow—two were deleted because of space limitations.)

Of the seven package categories, general business programs commanded the highest performance ratings, averaging 6.7, followed by general accounting packages, with a 6.4. The more complex types of applications programs, such as manufacturing packages, project management, and payroll/personnel, had lower average scores. Indeed, the payroll/personnel group scored a significant one point below the norm, or 5.7.

LOWER SUPPORT RATINGS

Since few if any users have consistently good things to say about the vendor support of software, perhaps it comes as no surprise that vendor support ratings were lower than the ratings for the packages themselves. Support ratings are a composite of user votes on three categories: responsiveness, training, documentation.

General accounting packages scored the highest level of any in terms of vendor support, 6.3, probably because these programs are older and more likely to have perfected training and documentation. Interestingly, two fields that have long experience with applications software, banking and insurance, indicated many problems with vendor support—the rating was 5.8 for each. General business programs received a 6.2 rating for support, and project management packages tallied a 6.1.

Little discernible difference in operational characteristics were noted by the users. Asked to rate the ability of programs to handle expanded processing volumes, recovery/backup capabilities, and security provisions, users gave the group a 6.4 score, with a narrow range depending on type of application—6.7 for general accounting packages to 6.2 for banking, general business, and manufacturing.

Ever wonder if other applications software packages had easier data entry? The bad news may be that few users think their packages are ideal. The average input/output rating—indicating level of satisfaction with data entry, output procedures, and ease of format change—was 6.1, with a narrow range from the established general accounting programs at 6.3 to the 5.7 for payroll.

Whether he is buying a car, a tomato, or a sofa, a customer always wants to get the best value for his dollar. Respondents rating their applications software indicated that their packages were a good value in most cases; about a third considered them an excellent value, and only 4% of them a poor value. Value, in this survey as well as in real life, was defined as features and capabilities relative to cost.

An excellent value has two meanings, of course: most of the "excellent" ratings went to products with outstanding features at a price comparable to or lower than the competition, while about a third of the excellent ratings were voted because the packages provided good features and capabilities at a price substantially lower than the competition. In rating products considered good values, 40% of the users felt that if the product had good features at a price comparable to competitive packages, it was good.

A product that had outstanding features but was higher priced was rated good by 13% of the users. A few users, 4%, considered a product good if it didn't have many features but was cheap.

No one should ever accuse software salesmen of the tactics closely associated with used-car salesmen. Nine out of 10 users said that the package did what the vendor said it could, and eight out of 10 said their packages met or exceeded vendor promises regarding speed, performance, and efficiency. Overall, two thirds of the users said that the package met the vendor's promises.

The older and less complex applications more frequently met or exceeded vendor claims. Three quarters of the general business programs delivered what the salesmen said they would, but insurance packages and payroll and project management packages in general were only a 50-50 gamble. Two thirds of the banking package users felt that the packages and vendors delivered, along with 61% of the users of the manufacturing packages and 72% of the users of general accounting packages.

Users were also asked which of four types of vendor support services they used and how they rated those services on a 10 point scale. The services investigated were on-site, telephone hot line, on-line, and mail. Nearly nine out of 10 users (88%) reported using the vendor's telephone hot line support service; 62% used their vendor's on-site support and mail support service; and almost two in 10 used an on-line support service.

SUPPORT SERVICE RATINGS

Support services ratings are reported only for packages that met a minimum reporting standard of 10 respondents. The average score for the 73 packages that met the standard for on-site support services was 6.6. These scores show little variation from group to group.

The average score for the 81 packages with telephone hot line support services was 6.2, with average scores ranging from a low of 5.8 for the payroll/personnel group to a high of 6.5 for the manufacturing, project/industrial management, and business/office administration groups.

The average score for the 17 packages that met the standard for on-line support services was 6.0. The average scores for packages in the seven groups range from a low of 5.5 for the business/office administration group to a high of 6.6 for the insurance group. Too few packages met the reporting standard to permit group averages to be calculated for the payroll/personnel, project/industrial management, and banking/financial groups.

The average score for the 72 packages that met the standard for mail support services was 5.7. The average scores for packages in the seven groups ranged from a low of 5.5 for the banking/financial and insurance groups to a high of 6.1 for the business/office administration group.

Users were asked to provide an overall rating for services based on the quality, speed, and usefulness of the vendor's response to product enhancement requests and the accessibility of support facilities; to the quality and currency of user documentation updates; and on the availability and quality of training.

The average package studied received an overall vendor/vendor-supplied services rating of superior from 11% of its users, a very good rating from 48%, an acceptable rating from 33%, and an inadequate rating from 6%. On the 10 point scale, the mean score was 6. Of the seven package groups, the average general accounting package received the highest overall vendor/vendor-supplied sevices score, 6.2, and the lowest score, 5.8, was shared by the average insurance and project/industrial management package.

Only 14% of the users of the average package report that they have evaluated alternative packages since their package was acquired. Of this group, 3% evaluated alternative packages offered by their computer vendor, and 11% evaluated alternatives from independent vendors.

Of the seven groups, users of the average business/office administration package were most likely to have evaluated alternative packages (24%), and users of the average general accounting package were least likely to have done so (only 7%).

Between these poles were insurance packages (21%), project/industrial management packages (17%), manufacturing packages (14%), payroll/personnel packages (13%), and banking/financial packages (11%).

Only one in seven users (14%) of the typical applications package reported that they

No one should ever accuse software salesmen of used-car dealer tactics.

are actively considering replacing it. There are relatively small differences among the package groups, which range from 20% for project/industrial management packages to 9% for payroll/personnel packages.

Users who were thinking of replacing their packages were most likely doing so because they needed features that were not available in their current package (34%) or because they were upgrading or changing to an incompatible system (21%). Twelve percent of those thinking of replacing their packages were doing so because of slow execution speed, and 11% claimed that the upgrade/expansion capabilities offered for the current package were too expensive. A final 11% claimed their packages were just generally unsatisfactory.

To clarify how they made their purchasing decisions in the first place, users were asked to evaluate the influence of eight factors on their acquisition decisions. Specific features and capabilities emerged as the primary influence. Eighty-one percent of the users of the average packages studied—including at least 76% of the users in each of the seven package groups—said this factor had a major influence.

Productivity/ease of use ran a distant second (54%). Overall vendor presence or reputation in the industry, compatibility with existing software, and cost and/or time required to implement the package internally were each cited as major factors by more than three out of 10 users.

In contrast, uniqueness of the application was considered a major influence by only 26%, experience with other packages from the same vendor was a major influence for only 18%, and a consultant or third-party recommendation was considered a major influence by only 14%.

OTHER PACKAGES EVALUATED

About three quarters of the respondents said that alternative packages were evaluated before they decided to acquire their package. Twenty percent evaluated an average of 1.5 alternatives available from their computer vendor, and 66% evaluated an average of 3.7 alternatives offered by independent vendors.

Among the seven groups, users of the average manufacturing package most likely evaluated an alternative package (86% did so), both from independent vendors (86%) and from their computer vendor (48%). Although users of the average business/office administration package are least likely to have evaluated alternative packages, the majority (63%) still did so.

As for the operating environment, the average package included in the survey had been installed for 37 months, with the banking/financial group package installed for the longest time, 45 months, and the manufacturing group for the shortest, 28 months.

Sixty-one percent of the surveyed users indicated that to the best of their knowledge, they were using their package's latest version or release; one third indicated that a more current version had been released but was not being used; and 7% did not know which release they were using.

Package currency among the seven groups varied widely from a low of 47% for the average manufacturing package to a high of 72% for the average project/industrial management package. The latest versions were being used for 67% of the payroll/personnel packages, 64% of the insurance packages, 63% of the general business packages, 60% of the banking/financial packages, and 58% of the general accounting packages.

Two thirds of the packages studied run primarily on IBM computers. Only 6% run on the second most popular host, Digital Equipment. Following those two are Hewlett-Packard, 4%; Burroughs, 3%; and Wang, Amdahl, Honeywell, and Sperry, each with 2% of the packages. Texas Instruments, Itel, Data General, and Magnuson each host 1%, and computers from other unspecified vendors host the remaining 10%.

A breakdown of host vs. package-type figures shows that 70% to 80% of the general accounting, banking/financial, project/industrial management, and payroll/personnel groups run on IBM hosts. Conversely, only 50% of the general business packages, 44% of the insurance packages, and 31% of the manufacturing packages do so. In the manufacturing category, 33% run on Hewlett-Packard, 17% run on DEC, and 7% run on Data General systems.

The following bar charts summarize users' overall ratings of the 82 packages included in this survey. With each chart is the number of user responses, the percentage of users who judged their package and vendor support outstanding (giving overall ratings of 9 or 10 in each category), the percentage of users seeking to replace the package, and the percentage of this group citing unsatisfactory performance as the reason.

Despite the scope of this year's survey, like any survey it concentrates on a limited universe. Many excellent products were excluded because of our statistical criteria. Unfortunately, no survey can set absolute standards for evaluating a software package that would be relevant to a particular installation and end user. But it can give a starting point for discussions among dp managers, software suppliers, and the end users.

Ratings Summaries

GENERAL ACCOUNTING PACKAGES—
21 packages studied.
7.9—Disk Account Reconciliation
7.7– Timberline Systems MAC
7.5—Insight Software INSIGHT
7.4—Data Design Fixed Asset Accounting
7.3—Data Design Accounts Payable/Purchasing Control
7.2—Westinghouse IAI Financial Accounting; MSA General Ledger
7.0—MSA Fixed Assets
6.9—UCC Fortex CARMS; MSA Accounts Receivable; MSA Accounts Payable; ISA Accounting and Budget System
6.8—**Group Average;** McCormack & Dodge General Ledger Plus
6.6—ISA Cash Disbursement System
6.5—McCormack & Dodge Fixed Assets Plus
6.3—McCormack & Dodge Accounts Payable Plus; UCC Financial Control System
6.2—Software International Accounts Receivable; ISA Accounts Payable
6.1—Software International Accounts Payable
5.3—ISA General Ledger

PAYROLL/PERSONNEL PACKAGES—
9 packages studied.
7.4—Integral Systems Payroll/Personnel
7.3—MSA Payroll Accounting System
7.1—MSA Personnel Management & Reporting System
7.0—MSA Human Resources System
6.4—**Group Average**
5.8—Cyborg Systems Payroll/Personnel
5.7—Westinghouse Payroll/Personnel
5.3—McCormack & Dodge Human Resources Plus; Information Sciences Human Resources System

GENERAL BUSINESS PACKAGES—
15 packages studied.
8.0—MSA ALLTAX
7.8—Execucom IFPS
7.4—SPSS Batch System; List Processing Carrier Route Coding
7.3—Computer Associates CA-Autotab; ISSCO Tel-A-Graf
7.1—Aim Plus Aims Plus; ADR Empire
7.0—ISSCO Disspla; ISA Foresight
6.9—**Group Average**; ADR ETC
6.8—American Software Sales Forecasting
6.6—Xerox Business Management System
5.6—Interactive Management Financial Management System
5.5—MSA Forecasting and Modeling System

BANKING & FINANCIAL PACKAGES—
20 packages studied.
7.8—UCC Super MICR
7.7—Bob White On-line Banking System
7.5—Stockholder Systems PEP
7.3—Weiland Software Demand/Deposit Credit Reserve
7.2—Stockholder Systems Corporate Shareholder System

7.1—Hogan Systems, The Umbrella System
6.9—Florida Software Direct Deposit Accounting
6.8—Remote Computing Savings and Loan System
6.7—UCC Customer Information System
6.6—**Group Average**; Florida Software Commercial Loan System
6.5—Florida Software Certificate of Deposit
6.4—Hogan Systems Integrated Deposits System; Citizens Automated Canton System/1990
6.3—Hogan Systems Prophet; Dyatron Pro-Trust
6.2—UCC Paperless Item Processing; Florida Software Mortgage Loan System
6.1—UCC Commercial Loan System
5.5—UCC Installment Loan System
4.9—Florida Software Financial Management System

INSURANCE PACKAGES—
4 packages studied.
7.1—Logic Inc. Credit Life Administration
6.6—Insurenet Inc. Insurenet
6.5—**Group Average**
6.4—Pallm Inc. Pallm System
6.0—Informatics General Life-Comm

MANUFACTURING PACKAGES—
7 packages studied.
7.3—Ask MANMAN
7.1—Comserv AMAPS
6.8—NCA Maxcim
6.7—Cincom MRPS
6.6—**Group Average**
6.5—MSA ARISTA Manufacturing System
5.8—Martin-Marietta MAS Manufacturing Control System
5.7—Automated Quill Mini-Miz/PAIS

PROJECT & INDUSTRIAL MANAGEMENT PACKAGES—
6 packages studied.
7.3—Thomas Laguban Associates E-PICS
6.9—Boeing Executive/Information Services
6.8—AGS Management PAC Systems
6.3—**Group Average**
6.1—AGS Management SDM/70
5.4—AGS Management Project Control/70
5.4—MSA Inventory & Purchasing System

REPORT AVAILABLE

This survey is based on a forthcoming report in *Software*, a monthly updated information service available by subscription that covers systems and applications software for mainframes, minicomputers, and micros. Additional information is available from Data Decisions, 20 Brace Rd., Cherry Hill, NJ 08034. The telephone number is (609) 429-7100.

AV. TOLERANCES FOR 68% CONFIDENCE LEVEL

	OVERALL SATISFACTION			SPECIFIC ATTRIBUTE RATINGS			
Sample Size	**6.0 or Under**	**7.0**	**8.0 or Higher**	**5.0 or Under**			**8.0 or Higher**
60 or more	.20	.20	.15	.30	.30	.30	.25
50–59	.25	.25	.20	.30	.30	.30	.25
40–49	.30	.25	.25	.35	.30	.30	.25
30–39	.30	.30	.25	.35	.35	.30	.30
15–29	.40	.40	.35	.50	.50	.45	.40

As in all sample surveys, the numbers reported are estimates within a range of what would have been obtained if all user sites in the survey universe had been surveyed. The margins of sampling variation, or tolerances, for the ratings on overall satisfaction and specific attributes range from .2 to .5. This means that the chances are approximately two in three that a reported rating differs by no more than the indicated tolerance from the rating that would have been obtained if all eligible sites had been surveyed. For example, if a sample of 30 sites gives a software package an overall satisfaction rating of 7.0, the table indicates a tolerance of 0.30. Thus, the chances are two in three that the interval 6.70–7.30 includes the rating that would have been obtained had all eligible sites been surveyed.

METHODOLOGY

The objective of the survey, which was designed by Data Decisions and conducted by Beta Research Corp., Syosset, N.Y., was to collect data on the packages' operating environments and find out how respondents feel about the packages they use and the support they receive from vendors.

The universe for the survey consists of applications packages designated by International Computer Programs, Indianapolis, as having generated $5 million or more in sales; 155 packages marketed by 92 companies were initially identified as having met this qualification.

On July 8, 1983, a registered letter was sent to each of these companies enlisting their cooperation. Each company was asked to supply a list of the 125 most recent customers who had had the package installed and running for at least six months as of July 1, 1983. For those packages with fewer than 125 qualified customers, the company was asked to supply its complete customer file. Companies were also asked to certify that the lists they submitted met these criteria and that they would make no effort to contact customers with regard to the survey. Respondents were also asked whether they were contacted by the vendor.

A minimum of two follow-up phone calls was made to each company in an effort to gain the maximum cooperation and to ensure that each had the opportunity to participate. About half, or 49 companies, responded, providing lists for 79 different application packages, or 51% of the programs originally identified for inclusion in the sample.

Of the user lists submitted, five were for packages that were no longer marketed and one was for a package that also appeared on the ICP list under another name. These packages were removed from the sample. Five more lists with fewer than 29 names, the minimum mailing sample, were also dropped. This left 68 packages with user lists provided by 39 companies.

To expand the number of ratable packages and increase the participation of leading packages as identified by the ICP list, Data Decisions obtained user lists from Computer Intelligence Corp., La Jolla, Calif., for 14 additional packages marketed by six companies. These additional lists brought the total survey universe to 82 packages from 45 companies.

THE MAILING

During the last week of September 1983, 6,265 questionnaires were sent to known users of the 82 packages. Questionnaires were addressed to the vendor's primary contact at each location; the contact was asked to give the questionnaire to someone who used the package if the contact was not personally a user. To encourage a prompt response, a $1 incentive was included in the mailing. A second mailing in mid-October, without an incentive, was made to all nonrespondents.

A total of 3,323 questionnaires was returned; 95 were undeliverable by the postal service. To provide a minimum response rate of 40% and a minimum user base of 15 for each package, telephone interviews were conducted with nonrespondents. The questions asked in the telephone interviews were identical to those included in the mail survey. Fifty-three telephone interviews brought the total number of responses to 3,376, for an overall response rate of 55%. This figure includes 413 respondents who indicated that the package was not currently being used at the installation.

Ratings Values

10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

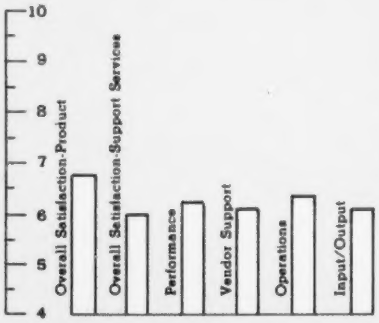
▬ Specific Product Rating
▭ Group Average Rating

GENERAL ACCOUNTING

■ OVERALL SUMMARY

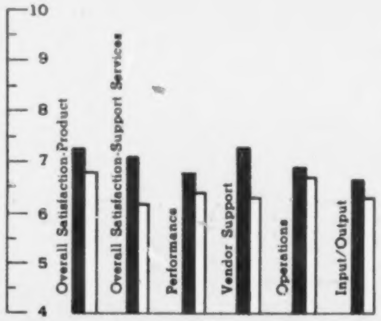
Average—All Packages • 82 packages

2,903 responses • 15% judged package and 11% judged vendor outstanding • 14% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



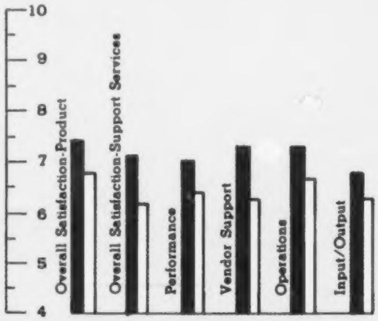
ACCOUNTS PAYABLE—PURCHASING CONTROL • Data Design Associates, 1250 Oakmead Parkway, Suite 310, Sunnyvale, CA 94086 • 408-730-0100

81 responses • 24% judged package and 24% judged vendor outstanding • 12% actively seeking to replace package with 2% citing unsatisfactory performance as reason.



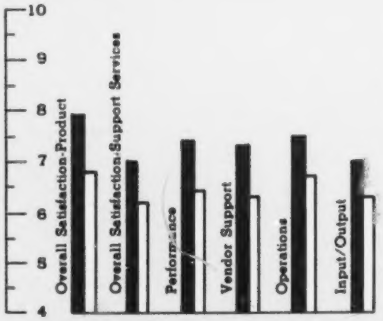
FIXED ASSET ACCOUNTING • Data Design Associates, 1250 Oakmead Parkway, Suite 310, Sunnyvale, CA 94086 • 408-730-0100

53 responses • 36% judged package and 21% judged vendor outstanding • 2% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



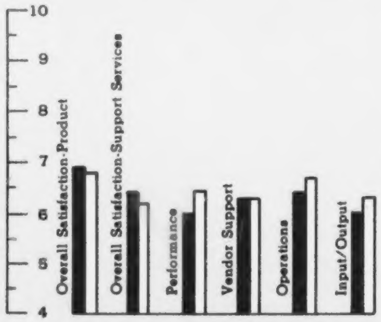
ACCOUNT RECONCILIATION • Disc, Inc., 3837 Maylors Lane, Baltimore, MD 21208 • 301-486-0410

56 responses • 38% judged package and 13% judged vendor outstanding • 4% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



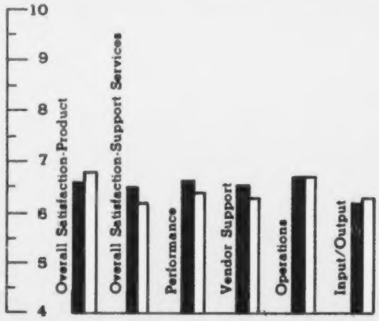
ISA ACCOUNTING & BUDGETING SYSTEM • Information Systems of America, P.O. Box 47975, Atlanta, GA 30362 • 404-441-8800

35 responses • 11% judged package and 9% judged vendor outstanding • 9% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



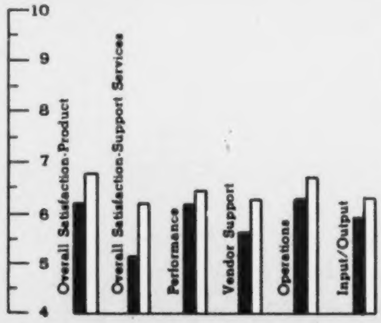
ISA/CASH DISBURSEMENT SYSTEM • Information Systems of America, P.O. Box 47975, Atlanta, GA 30362 • 404-441-8800

47 responses • 11% judged package and 13% judged vendor outstanding • 6% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



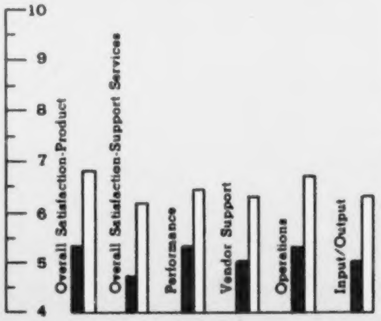
ISA/ACCOUNTS PAYABLE • Information Systems of America, P.O. Box 47975, Atlanta, GA 30362 • 404-441-8800

24 responses • 13% judged package and 0% judged vendor outstanding • 38% actively seeking to replace package, with 13% citing unsatisfactory performance as reason.



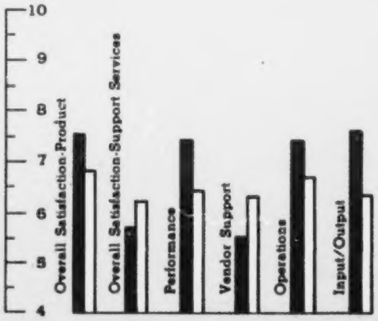
ISA/GENERAL LEDGER • Information Systems of America, P.O. Box 47975, Atlanta, GA 30362 • 404-441-8800

24 responses • 0% judged package and 0% judged vendor outstanding • 50% actively seeking to replace package, with 13% citing unsatisfactory performance as reason.



INSIGHT • Insight Software Systems, One N. Broadway, Suite 901, White Plains, NY 10601 • 914-682-4910

27 responses • 19% judged package and 11% judged vendor outstanding • 0% actively seeking to replace package.



Ratings Values

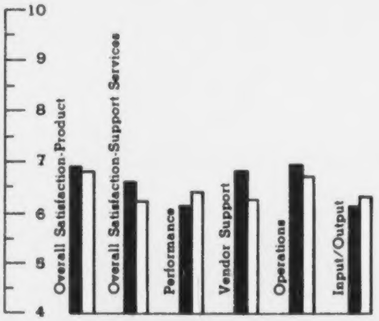
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

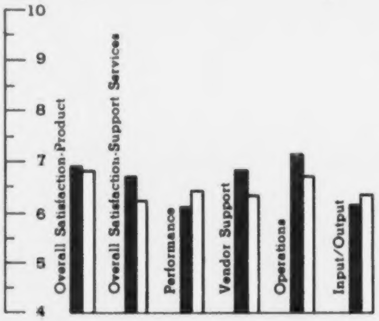
ACCOUNTS PAYABLE • Management Sciences America (MSA), 3445 Peachtree Road, NE, Atlanta, GA 30326 • 404-262-2376

54 responses • 17% judged package and 22% judged vendor outstanding • 13% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



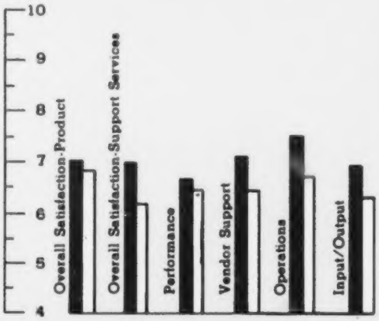
ACCOUNTS RECEIVABLE • Management Sciences America (MSA), 3445 Peachtree Road, NE, Atlanta, GA 30326 • 404-262-2376

58 responses • 11% judged package and 15% judged vendor outstanding • 9% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



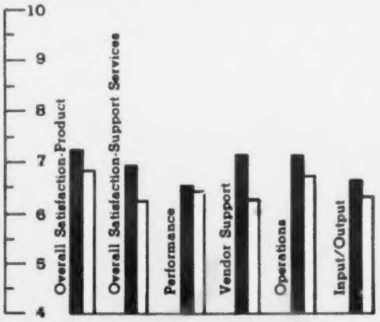
FIXED ASSETS • Management Sciences America (MSA), 3445 Peachtree Road, NE, Atlanta, GA 30326 404-262-2376

52 responses • 14% judged package and 15% judged vendor outstanding • 6% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



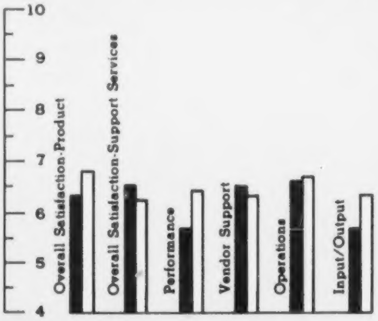
GENERAL LEDGER/FICS • Management Sciences America (MSA), 3445 Peachtree Road, NE, Atlanta, GA 30326 • 404-262-2376

64 responses • 20% judged package and 19% judged vendor outstanding • 3% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



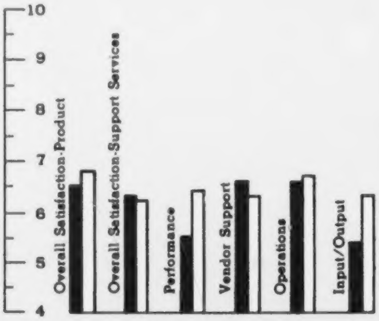
ACCOUNTS PAYABLE PLUS • McCormack & Dodge, 560 Hillside Avenue, Needham Heights, MA 02194 • 617-449-4012

38 responses • 5% judged package and 13% judged vendor outstanding • 5% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



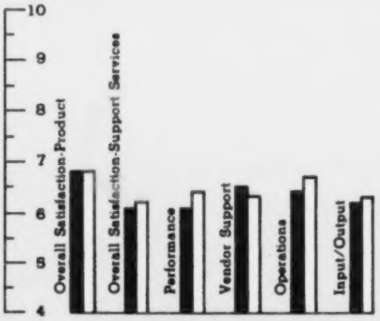
FIXED ASSETS PLUS • McCormack & Dodge, 560 Hillside Avenue, Needham Heights, MA 02194 • 617-449-4012

38 responses • 16% judged package and 11% judged vendor outstanding • 0% actively seeking to replace package.



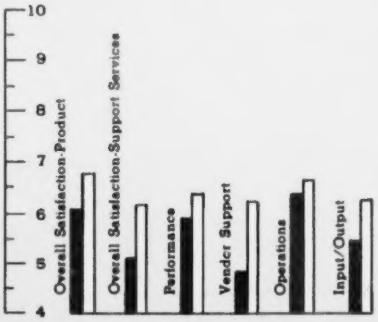
GENERAL LEDGER PLUS • McCormack & Dodge, 560 Hillside Avenue, Needham Heights, MA 02194 • 617-449-4012

84 responses • 19% judged package and 13% judged vendor outstanding • 4% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



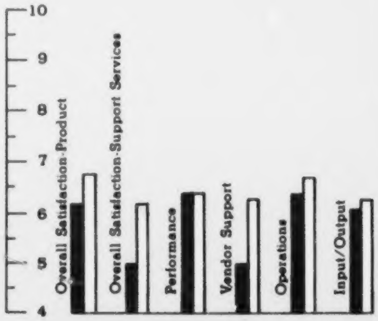
ACCOUNTS PAYABLE • Software International, One Technical Drive, Andover, MA 01810 • 617-685-1400

30 responses • 0% judged package and 0% judged vendor outstanding • 13% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



ACCOUNTS RECEIVABLE • Software International, One Technical Drive, Andover, MA 01810 • 617-685-1400

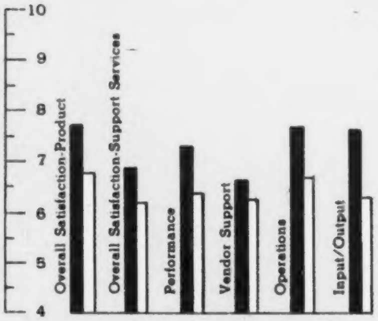
15 responses • 7% judged package and 7% judged vendor outstanding • 7% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



Ratings Values		Legend
10-9: Superior	**5-3:** Acceptable	▬ Specific Product Rating
8-6: Very Good	**2-1:** Inadequate	▭ Group Average Rating

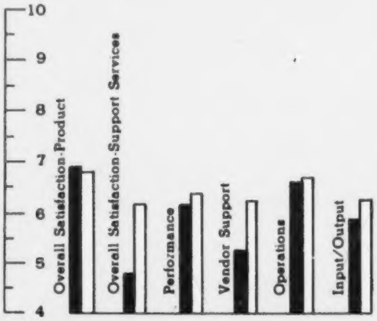
MANAGEMENT ACCOUNTING FOR CONSTRUCTION (MAC) • Timberline Systems, 7180 S.W. Fir Loop, Portland, OR 97223 • 503-643-9461

46 responses • 44% judged package and 20% judged vendor outstanding • 0% actively seeking to replace package.



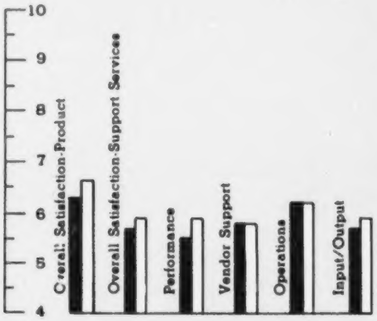
FORTEX CARMS • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7846

45 responses • 18% judged package and 7% judged vendor outstanding • 7% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



UCC FINANCIAL CONTROL SYSTEM • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7846

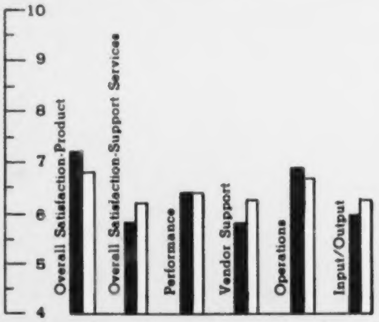
41 responses • 12% judged package and 2% judged vendor outstanding • 7% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



PAYROLL/PERSONNEL

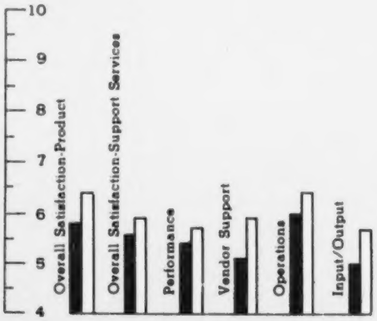
IAI FINANCIAL ACCOUNTING • Westinghouse Information Systems (formerly Information Assoc., Inc.), P.O. Box 30, Iowa City, IA 52244 • 319-354-9200

52 responses • 23% judged package and 4% judged vendor outstanding • 17% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



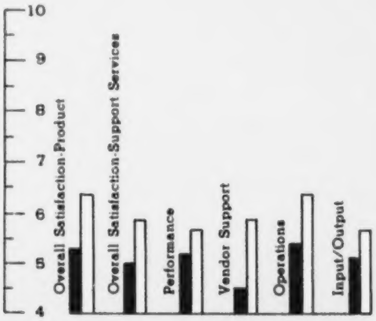
PAYROLL/PERSONNEL • Cyborg Systems, 2 North Riverside Plaza, Suite 2160, Chicago, IL 60606 • 312-454-1865

64 responses • 9% judged package and 8% judged vendor outstanding • 8% actively seeking to replace package, with 5% citing unsatisfactory performance as reason.



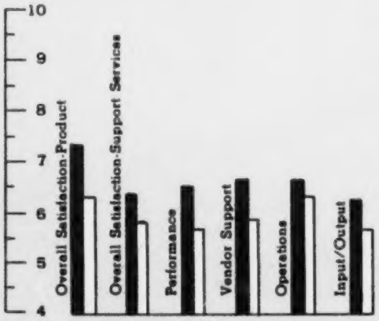
HUMAN RESOURCES SYSTEM • Information Sciences, 95 Chestnut Ridge Road, Montvale, NJ 07645 • 201-391-1600

29 responses • 0% judged package and 0% judged vendor outstanding • 21% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



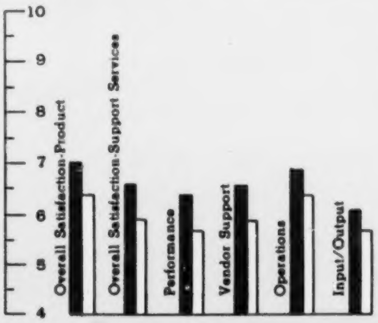
PAYROLL/PERSONNEL • Integral Systems, 165 Lennon Lane, Walnut Creek, CA 94598 • 415-939-3900

45 responses • 18% judged package and 13% judged vendor outstanding • 4% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



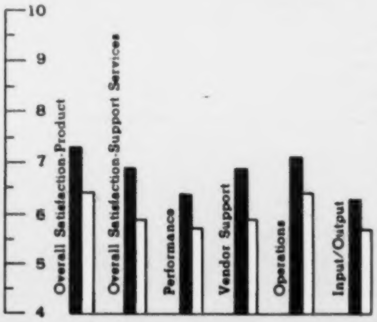
HUMAN RESOURCES SYSTEM • Management Sciences America (MSA), 3445 Peachtree Road, NE, Atlanta, GA 30326 • 404-262 2376

52 responses • 14% judged package and 17% judged vendor outstanding • 4% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



PAYROLL/PERSONNEL • Westinghouse Information Systems (formerly Information Assoc., Inc.), P.O. Box 30, Iowa City, IA 52244 • 319-354-9200

49 responses • 25% judged package and 27% judged vendor outstanding • 4% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



Ratings Values

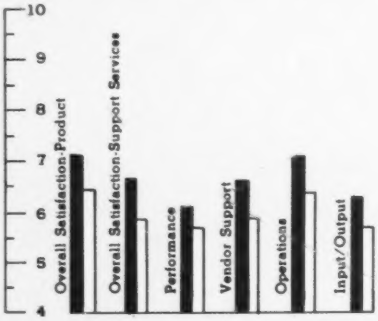
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

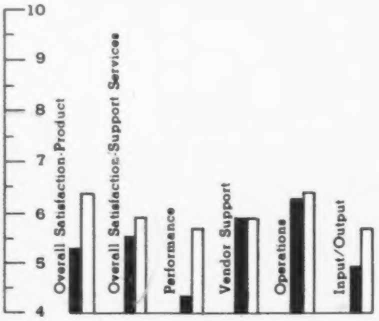
PERSONNEL MANAGEMENT & REPORTING SYSTEM ● Management Sciences America (MSA), 3445 Peachtree Road, NE, Atlanta, GA 30326 ● 404-262-2376

48 responses ● 13% judged package and 15% judged vendor outstanding ● 0% actively seeking to replace package.



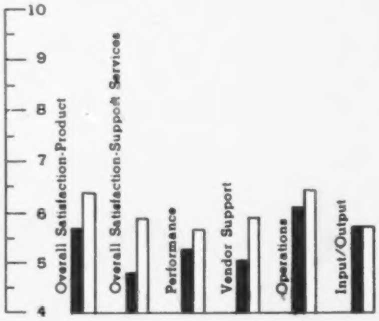
HUMAN RESOURCES PLUS ● McCormack & Dodge, 560 Hillside Avenue, Needham Heights, MA 02194 ● 617-449-4012

20 responses ● 0% judged package and 10% judged vendor outstanding ● 10% actively seeking to replace package, with 5% citing unsatisfactory performance as reason.



PAYROLL/PERSONNEL ● Westinghouse Information Systems (formerly Information Assoc., Inc.), P.O. Box 30, Iowa City, IA 52244 ● 319-354-9200

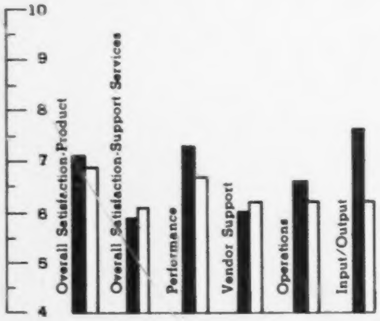
26 responses ● 12% judged package and 0% judged vendor outstanding ● 23% actively seeking to replace package, with 8% citing unsatisfactory performance as reason.



GENERAL BUSINESS

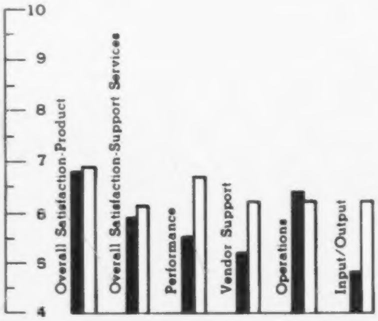
AIMS PLUS ● AIMS Plus, Inc., 5000 E. Benwhite, Suite 200, Austin, TX 78741 ● 512-385-0702

57 responses ● 32% judged package and 14% judged vendor outstanding ● 18% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



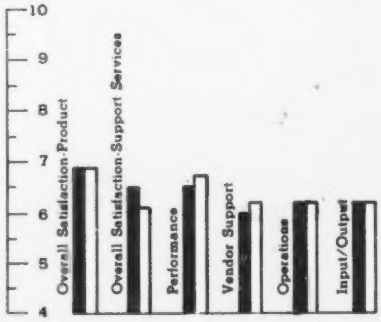
SALES FORECASTING ● American Software Co., 443 E. Paces Ferry Road, Atlanta, GA 30305 ● 404-261-4381

22 responses ● 18% judged package and 9% judged vendor outstanding ● 5% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



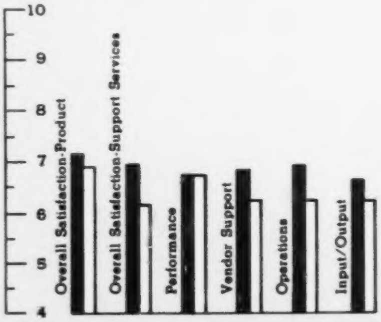
ADR/ETC ● Applied Data Research, Inc., Rt. 206 and Orchard Rd., CN-8, Princeton, NJ 08540 ● 201-874-9000

15 responses ● 27% judged package and 20% judged vendor outstanding ● 0% actively seeking to replace package.



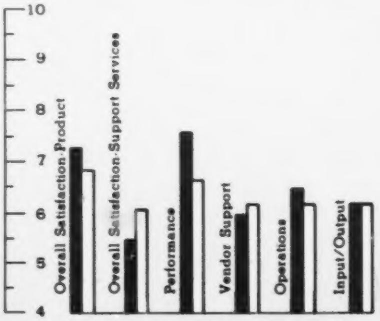
EMPIRE ● Applied Data Research, Inc., Rt. 206 and Orchard Rd., CN-8, Princeton, NJ 08540 ● 201-874-9000

18 responses ● 28% judged package and 28% judged vendor outstanding ● 17% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



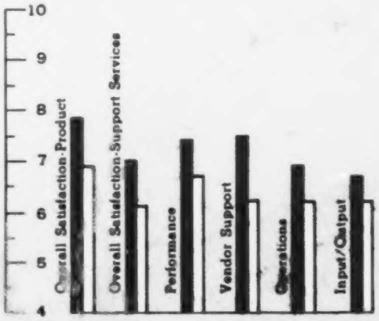
CA-AUTOTAB ● Computer Associates International, 125 Jericho Turnpike, Jericho, NY 11753 ● 516-333-6700

38 responses ● 16% judged package and 0% judged vendor outstanding ● 26% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



IFPS ● Execucom Corporation, P.O. Box 9758, Austin, TX 78766 ● 512-346-4980 ● 800-531-5038

70 responses ● 30% judged package and 17% judged vendor outstanding ● 3% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



Ratings Values

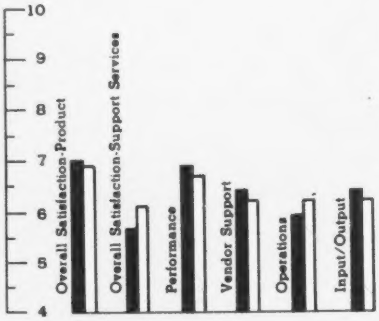
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

■ Specific Product Rating
☐ Group Average Rating

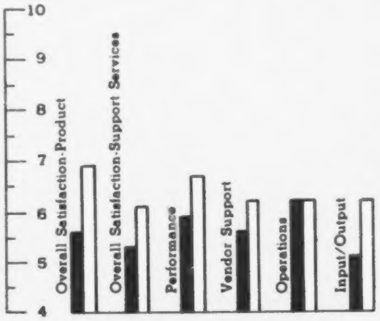
ISA/FORESIGHT • Information Systems of America, P.O. Box 47975, Atlanta, GA 30362 • 404-441-8800

80 responses • 24% judged package and 10% judged vendor outstanding • 24% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



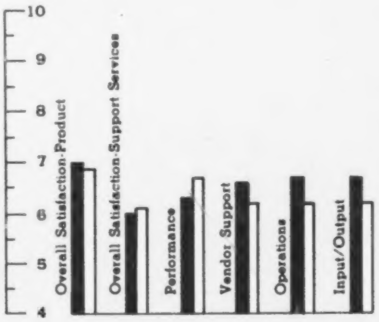
FINANCIAL MANAGEMENT SYSTEM • Interactive Management System, 375 Concord Avenue, Belmont, MA 02178 • 617-489-3550

28 responses • 0% judged package and 11% judged vendor outstanding • 32% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



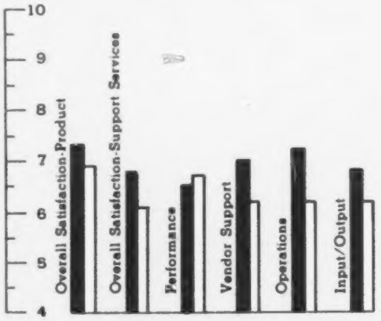
DISSPLA • ISSCO, 10505 Sorrento Valley Blvd., San Diego, CA 92121 • 619-452-0170

57 responses • 14% judged package and 7% judged vendor outstanding • 12% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



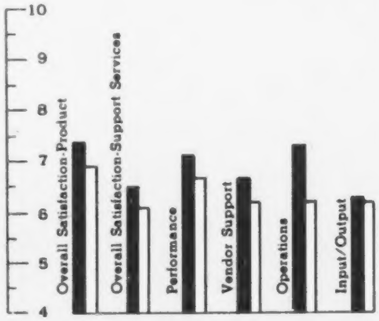
TEL-A-GRAF • ISSCO, 10505 Sorrento Valley Blvd., San Diego, CA 92121 • 619-452-0170

80 responses • 26% judged package and 20% judged vendor outstanding • 8% actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



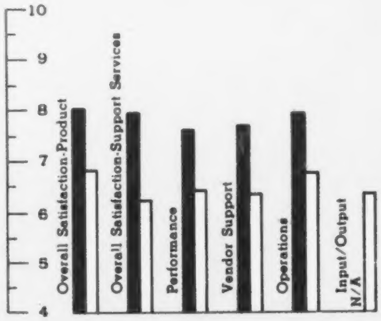
CARRIER ROUTE CODING • List Processing, Inc., 555 Waters Edge, Lombard, IL 60148 • 312-932-7000

52 responses • 17% judged package and 14% judged vendor outstanding • 10% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



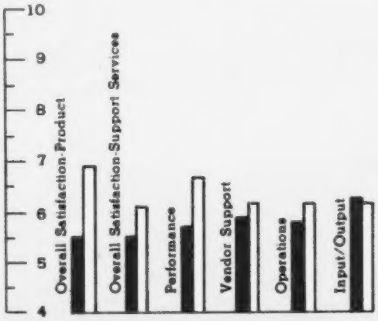
ALLTAX • Management Sciences America (MSA), 3445 Peachtree Road, NE, Atlanta, GA 30326 • 404-262-2376

54 responses • 43% judged package and 37% judged vendor outstanding • 20% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



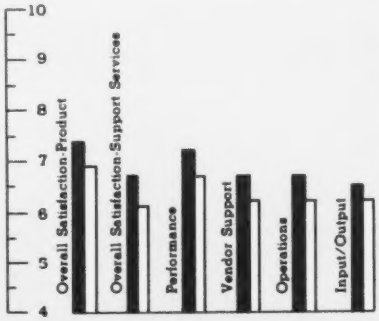
FORECASTING & MODELING SYSTEM • Management Sciences America (MSA), 3445 Peachtree Road, NE, Atlanta, GA 30326 • 404-262-2376

16 responses • 0% judged package and 6% judged vendor outstanding • 0% actively seeking to replace package.



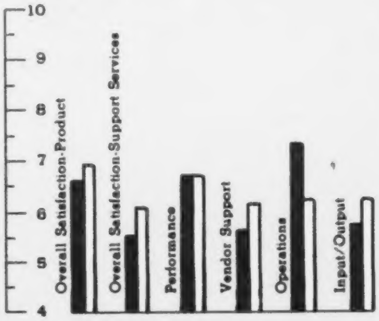
SPSS BATCH SYSTEM • SPSS, Inc., 444 N. Michigan Avenue; Chicago, IL 60611 • 312-329-2400

43 responses • 16% judged package and 9% judged vendor outstanding • 16% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



BUSINESS MANAGEMENT SYSTEM • Xerox Corporation, 5310 Beethoven Street, Los Angeles, CA 90066 • 213-306-4000

27 responses • 15% judged package and 7% judged vendor outstanding • 33% actively seeking to replace package, with 7% citing unsatisfactory performance as reason.



Ratings Values

10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

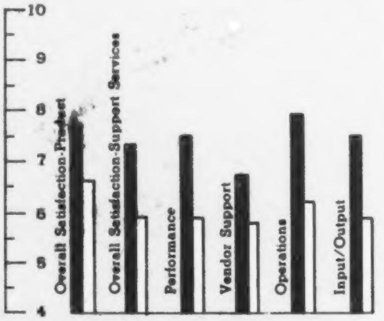
Legend

▬ Specific Product Rating
▭ Group Average Rating

BANKING & FINANCIAL

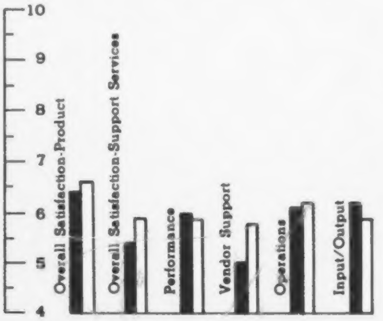
ONLINE BANKING SYSTEM • Bob White Computing, 830 Diane Lane, Naperville, IL 60540 • 312-887-1550

15 responses • 40% judged package and 20% judged vendor outstanding • 13% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



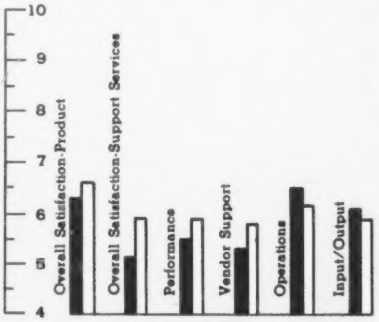
CANTON SYSTEM/1990 • Citizens Automated Systems, 100 Central Plaza South, Canton, OH 44701 • 216-489-3740

18 responses • 17% judged package and 17% judged vendor outstanding • 22% actively seeking to replace package, with 6% citing unsatisfactory performance as reason.



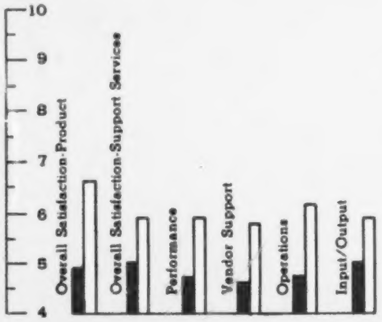
PRO-TRUST • Dyatron Corp., P.O. Box 235, Birmingham, AL 35201 • 205-956-7500

18 responses • 6% judged package and 6% judged vendor outstanding • 33% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



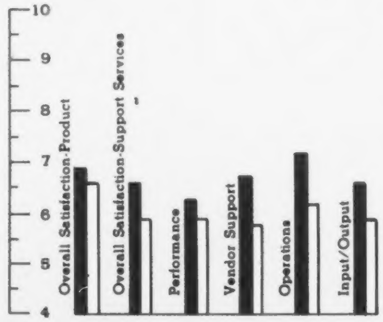
FINANCIAL MANAGEMENT SYSTEM (FMS) • Florida Software Services, P.O. Box 2269, Orlando, FL 32802 • 305-831-3001

15 responses • 0% judged package and 0% judged vendor outstanding • 27% actively seeking to replace package, with 20% citing unsatisfactory performance as reason.



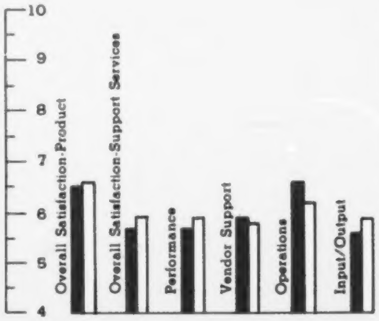
DIRECT DEPOSIT ACCOUNTING (DDA) • Florida Software Services, P.O. Box 2269, Orlando, FL 32802 • 305-831-3001

16 responses • 19% judged package and 13% judged vendor outstanding • 0% actively seeking to replace package.



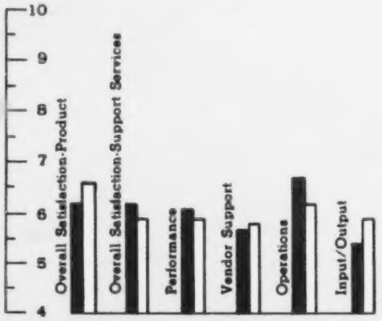
CERTIFICATE OF DEPOSIT (CD) • Florida Software Services, P.O. Box 2269, Orlando, FL 32802 • 305-831-3001

33 responses • 6% judged package and 9% judged vendor outstanding • 12% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



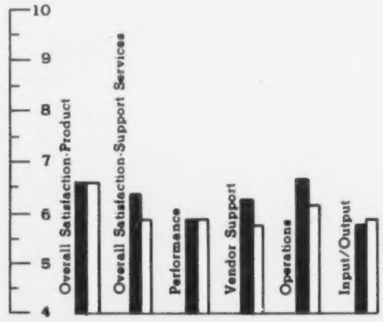
MORTGAGE LOAN SYSTEM • Florida Software Services, P.O. Box 2269, Orlando, FL 32802 • 305-831-3001

27 responses • 4% judged package and 4% judged vendor outstanding • 11% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



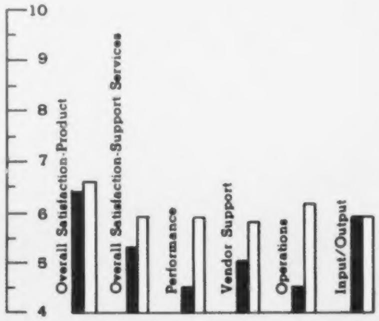
COMMERCIAL LOAN SYSTEM • Florida Software Services, P.O. Box 2269, Orlando, FL 32802 • 305-831-3001

35 responses • 6% judged package and 11% judged vendor outstanding • 9% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



INTEGRATED DEPOSITS SYSTEM • Hogan Systems, 14951 Dallas Parkway, Suite 400, Dallas, TX 75240 • 214-386-0020

16 responses • 0% judged package and 0% judged vendor outstanding • 0% actively seeking to replace package.



Ratings Values

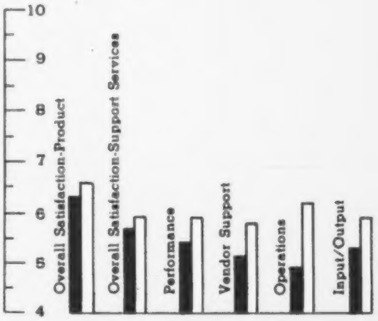
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

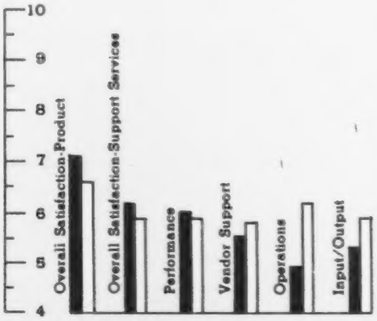
PROPHET • Hogan Systems, 14951 Dallas Parkway, Suite 400, Dallas, TX 75240 • 214-386-0020

13 responses • 7% judged package and 0% judged vendor outstanding • 0% actively seeking to replace package.



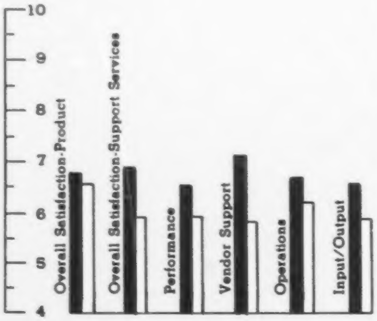
THE UMBRELLA SYSTEM • Hogan Systems, 14951 Dallas Parkway, Suite 400, Dallas, TX 75240 • 214-386-0020

19 responses • 21% judged package and 5% judged vendor outstanding • 0% actively seeking to replace package.



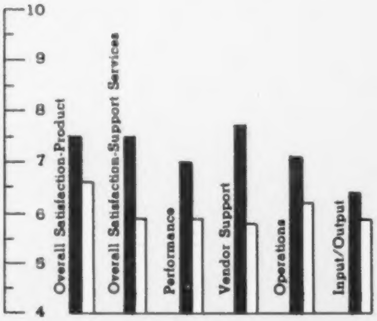
SAVINGS & LOAN SYSTEM • Remote Computing, 1076 E. Meadow Circle, Palo Alto, CA 94303 • 415-494-6111

38 responses • 18% judged package and 21% judged vendor outstanding • 40% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



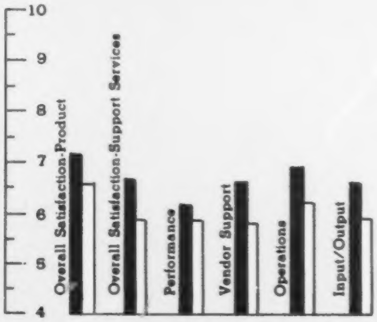
PEP • Stockholder Systems, 1965 N. Park Place, Atlanta, GA 30339 • 404-952-3387

54 responses • 20% judged package and 30% judged vendor outstanding • 11% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



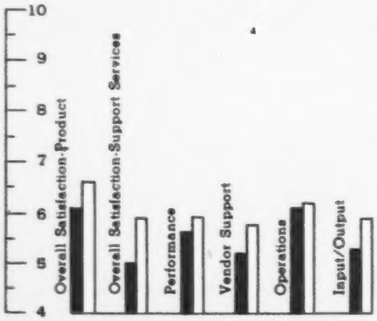
CORPORATE SHAREHOLDER SYSTEM • Stockholder Systems, 1965 N. Park Place, Atlanta, GA 30339 • 404-952-3387

47 responses • 21% judged package and 11% judged vendor outstanding • 23% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



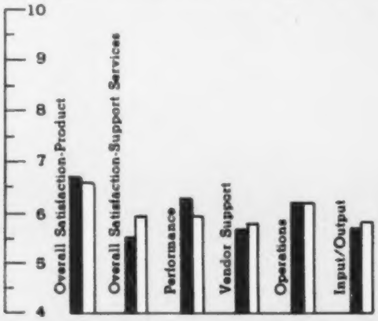
UCC COMMERCIAL LOAN SYSTEM • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7846

23 responses • 4% judged package and 0% judged vendor outstanding • 26% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



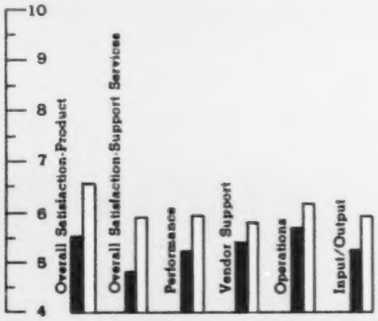
UCC CUSTOMER INFORMATION SYSTEM • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7846

39 responses • 10% judged package and 3% judged vendor outstanding • 21% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



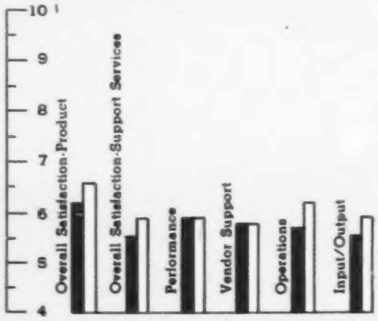
UCC INSTALLMENT LOAN SYSTEM • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7846

41 responses • 5% judged package and 2% judged vendor outstanding • 27% actively seeking to replace package, with 5% citing unsatisfactory performance as reason.



UCC PAPERLESS ITEM PROCESSING (PIP) • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7846

53 responses • 11% judged package and 0% judged vendor outstanding • 27% actively seeking to replace package, with 5% citing unsatisfactory performance as reason.



Ratings Values

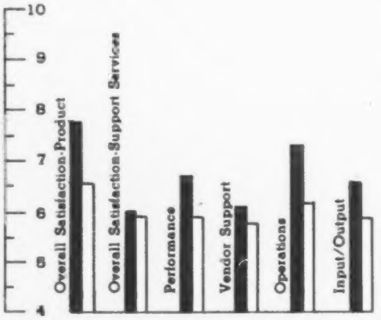
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

■ Specific Product Rating
□ Group Average Rating

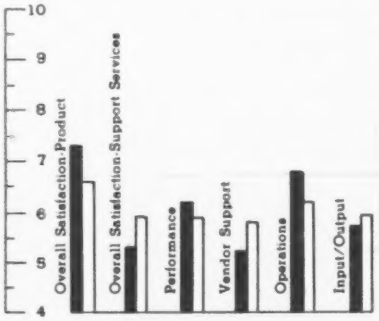
UCC SUPER MICR • University Computing Co., UCC Tower, Exchange Park, Dallas, TX 75235 • 214-353-7846

46 responses • 30% judged package and 13% judged vendor outstanding • 17% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



DEMAND DEPOSIT/CREDIT RESERVE • Weiland Software Group, 240 Fencl Lane, Hillside, IL 60162 • 312-449-2033

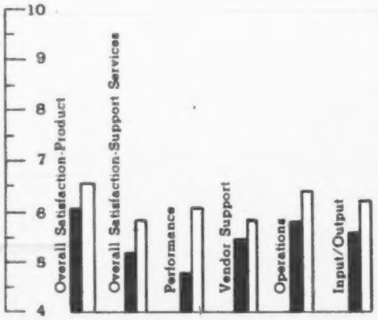
17 responses • 12% judged package and 0% judged vendor outstanding • 47% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



INSURANCE

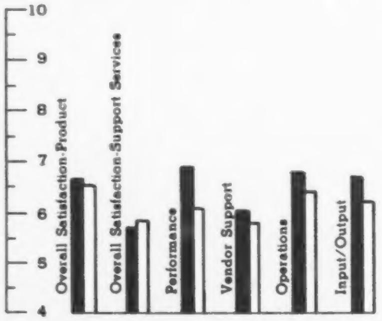
LIFE-COMM • Informatics General Corp., 21031 Ventura Blvd., Suite 800, Woodland Hills, CA 91364 • 213-887-9040

38 responses • 0% judged package and 0% judged vendor outstanding • 13% actively seeking to replace package, with 5% citing unsatisfactory performance as reason.



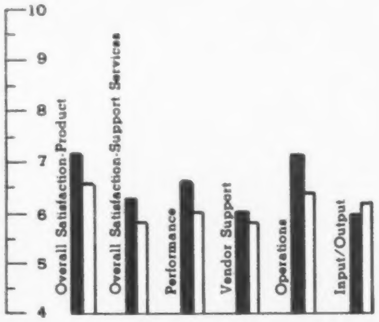
INSURENET • Insurenet, Inc., 1900 Powell Street, Emeryville, CA 94608 • 415-652-3771

33 responses • 15% judged package and 9% judged vendor outstanding • 27% actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



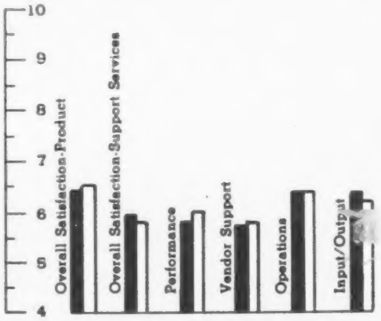
CREDIT LIFE ADMINISTRATION • Logic, Inc., 2720 Stemmens Freeway, 1100 Stemmens Tower South, Dallas TX 75207 • 214-630-6131

18 responses • 27% judged package and 13% judged vendor outstanding • 13% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



PALLM SYSTEM • PALLM, Inc., 2606 Fortune Circle, East Drive, Indianapolis, IN 46241 • 317-243-7591

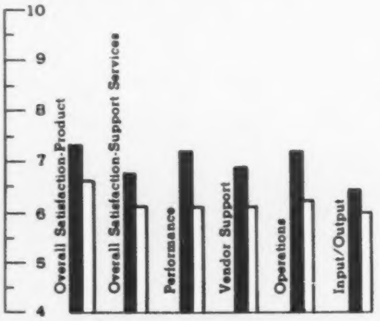
44 responses • 9% judged package and 16% judged vendor outstanding • 16% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



MANUFACTURING

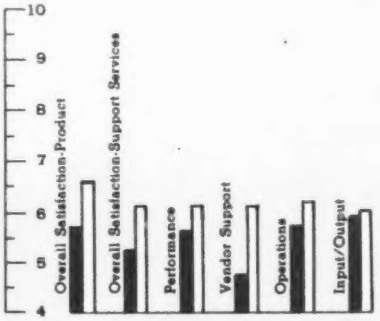
MANMAN • Ask Computer Systems, 730 Distel Drive, Los Altos, CA 94022 • 415-969-4442

66 responses • 26% judged package and 14% judged vendor outstanding • 9% actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



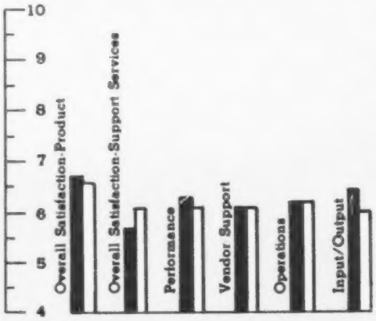
MINI-MIZ/PAIS • Automated Quill, Inc., 3501 S. Corona, Top Floor, Englewood, CO 80110 • 303-761-2722

18 responses • 6% judged package and 6% judged vendor outstanding • 22% actively seeking to replace package, with 11% citing unsatisfactory performance as reason.



MRPS • Cincom Systems, Inc., 2300 Montana Avenue, Cincinnati, OH 45211 • 513-662-2300

16 responses • 13% judged package and 0% judged vendor outstanding • 19% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



Ratings Values

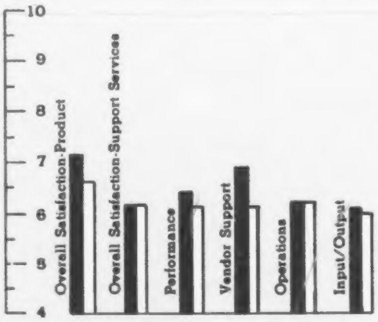
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▭ Group Average Rating

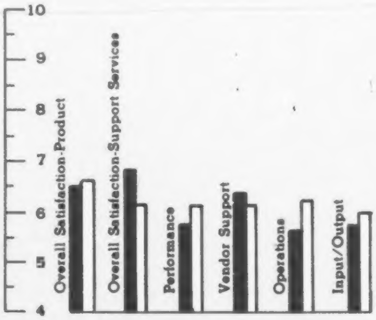
AMAPS • Comserv, 3400 Comserv Drive, Eagan, MN 55122 • 612-681-7000

47 responses • 21% judged package and 13% judged vendor outstanding • 9% actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



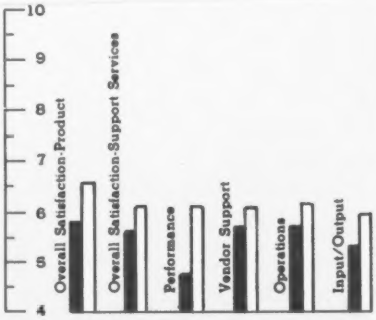
ARISTA MANUFACTURING SYSTEM • Management Sciences America (MSA), 3445 Peachtree Road, NE, Atlanta, GA 30326 • 404-262-2376

17 responses • 6% judged package and 12% judged vendor outstanding • 6% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



MAS MANUFACTURING CONTROL SYSTEM • Martin-Marietta Data Systems, 6303 Ivy Lane, Greenbelt, MD 20770 • 301-982-6500

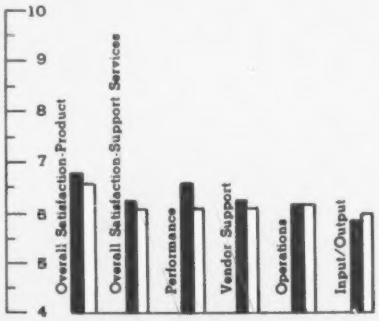
22 responses • 0% judged package and 5% judged vendor outstanding • 5% actively seeking to replace package, with 5% citing unsatisfactory performance as reason.



PROJECT MANAGEMENT

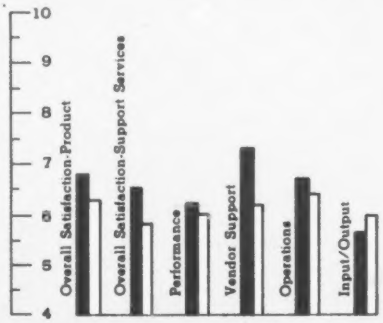
MAXCIM • NCA Corporation, 388 Oakmead Parkway, Sunnyvale, CA 94086 • 408-245-7990

41 responses • 15% judged package and 10% judged vendor outstanding • 22% actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



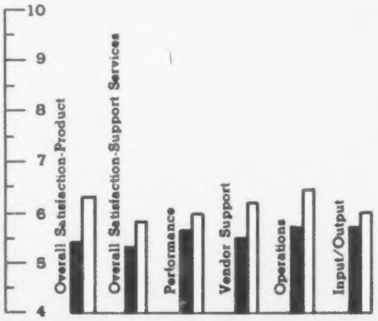
PAC SYSTEMS • AGS Management Systems, 320 Walnut Street, Philadelphia, PA 19106 • 215-922-7500

31 responses • 16% judged package and 16% judged vendor outstanding • 16% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



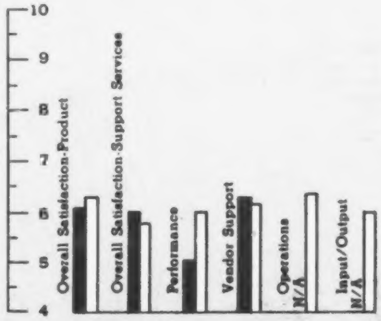
PROJECT CONTROL/70 • AGS Management Systems, 320 Walnut Street, Philadelphia, PA 19106 • 215-922-7500

17 responses • 0% judged package and 12% judged vendor outstanding • 6% actively seeking to replace package, with 6% citing unsatisfactory performance as reason.



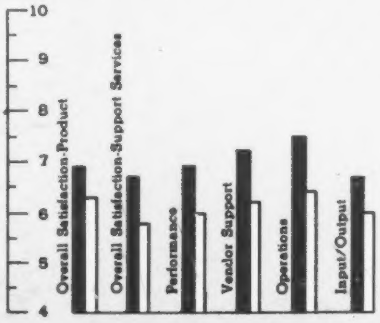
SDM/70 • AGS Management Systems, 320 Walnut Street, Philadelphia, PA 19106 • 215-922-7500

16 responses • 13% judged package and 6% judged vendor outstanding • 6% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



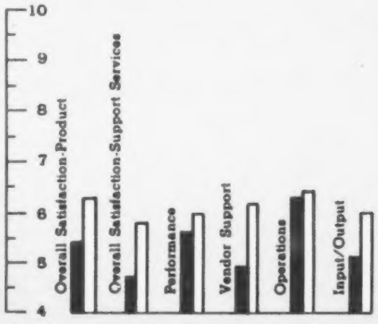
EXECUTIVE/INFORMATION SERVICES (EIS) • Boeing Computer Services, 7980 Gallows Court, Vienna, VA 22180 • 213-417-5010

17 responses • 18% judged package and 24% judged vendor outstanding • 65% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



INVENTORY & PURCHASING SYSTEM • Management Sciences America (MSA), 3445 Peachtree Road, NE, Atlanta, GA 30326 • 404-262-2376

31 responses • 3% judged package and 10% judged vendor outstanding • 19% actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



European companies are continuing to concentrate on the professional user.

THE SOFTWARE/ SERVICES SCENE

by John Lamb

At the end of last year Philips president Wisse Dekker lambasted the European software/services industry, claiming it suffered from a lack of creativity, poor production techniques, and distribution problems. All these ills have accumulated over time—too short a time, according to Dekker. "The computer as a medium has changed so quickly that the software industry has hardly had time to stabilize."

But stabilize it must, if it wants to score sales in the expanding markets of the future. "The software market of the future will be a consumer market," predicts Dekker. Companies that want to make it in that market, he explains, will have to be creative and not resort to the makeshift solutions they've used up until now.

Most European service companies are not looking that far into the future. Indeed, they generally seem content to concentrate on the broader professional computer market, leaving the smaller $1 billion microcomputer market to the newcomers. That traditional European market for computer services is valued at roughly $8 billion.

Defining that European market is another story. "Strictly speaking, there is no such thing as the European services industry," explains Doug Eyeions, director general of the European Computing Services Association (ECSA). "There's an Italian industry, a French industry, and so on with quite distinct differences between them," he notes.

FIG. 1

TOP 20 COMPUTER SERVICES COMPANIES IN WESTERN EUROPE

COMPANY	COUNTRY OF MAJORITY SHAREHOLDING	OWNED BY	SERVICES				EMPLOYEES	TOTAL 1982 REV.* ($ million)
			RCS	BATCH	SP	SS		
1 **IBM RCS**[1]	U.S.	public corporation	X	X			N/A	180.0
2 **Scicon Group**	U.K.	BP	X	X	X	X	3,500	175.4
3 **SG2 Group**	France	Société Générale/private	X	X	X	X	4,290	165.4
4 **CISI**	France	CEA (government/BNP)	X	X		X	2,700	162.7
5 **Cap Gemini Sogeti**	France	independent			X	X	4,000	155.7
6 **Geisco**	U.S.	General Electric	X		X	X	1,200	150.0
7 **Finsiel Group**	Italy	IRI/Banca d'Italia				X	2,320	139.3
8 **GSI**	France	CGE	X	X	X	X	2,350	138.2
9 **Datev**	West Germany	Tax Advisors Cooperative	X	X		X	1,830	101.2
10 **Sema Metra International**[2]	France	Paribas		X	X	X	1,400	88.6
11 **CCMC**	France	public accountants/staff/ Société Générale	X	X			1,180	81.0
12 **Control Data**	U.S.	public corporation	X	X	X	X	1,100	74.4
13 **Thomson Informatique**[3]	France	Thomson-CSF			X	X	1,750	74.1
14 **Datema**	Sweden	Johnsson Group	X	X		X	1,100	73.8
15 **Telesystemes**	France	PTT	X	X		X	1,590	73.6
16 **Sligos Group**	France	Credit Lyonnais/Tymshare	X	X	X	X	1,690	68.3
17 **CIG**	Belgium	Société Générale	X	X	X	X	1,040	66.3
18 **Kommunedata**	Denmark	local government	X	X		X	1,470	65.5
19 **SESA**	France	CGE/Cap Gemini Sogeti/ staff			X	X	680	59.6
20 **ICL Consultancy and Training**	U.K.	ICL			X	X	1,110	59.3

*Revenue derived from Europe
1. Includes revenue only from remote and batch services.
2. Includes revenue only from computing services.
3. Includes TITN, Syseca, and Answare.
Source: Quantum Science MAPTEK Europe.

RCS: Remote Computing Services
SP: Software Products
SS: Software Services

FIG. 2

COMPUTING SERVICES INDUSTRY IN WESTERN EUROPE

	COMPUTING SERVICES USER EXPENDITURE[1] 1982 ($ millions)	FORECAST % GROWTH RATE 1982-83		INFLATION[4] 1982-1983	GROSS DOMESTIC PRODUCT[5] 1982 ($ billions)	COMPUTING SERVICES AS % OF GDP
		ECSA[2] MEMBERS	QSC[3]			
Austria	126	N/A	7.5	4.5	67	0.19
Belgium	294	15.7	12.7	7.5	85	0.35
Denmark	311	13.6	10.6	6.3	55	0.56
Finland	243	24.1	12.0	9.5	48	0.50
France	1,690	23.9	13.5	9.3	537	0.32
Germany	1,220	10.7	9.7	3.5	655	0.19
Ireland	60	20.5	15.0*	12.5	18	0.34
Italy	818	16.6	13.5	16.3	348	0.24
Netherlands	579	11.6	12.4	4.6	138	0.42
Norway	261	12.1	9.3	10.0	56	0.46
Portugal	21	†	16.0*	20.8	23	0.09
Spain	233	18.4	15.7	13.0	180	0.13
Sweden	386	18.0	8.0	9.8	99	0.39
Switzerland	405	11.7	8.1	4.3	96	0.42
U.K.	1,490	15.9	14.5	5.8	472	0.32
Total W. Europe	8,140	—	12.2	9.0	2,880	0.28
U.S.	13,800	—	14.3	6.0	3,160	0.44

[1,3] Quantum Science MAPTEK Europe and MAPTEK USA
[2] ECSA members' estimates are calculated in local currency values and are from unweighted survey sample.
[3] QSC forecasts are from Quantum Science databases and are weighted.
[4] GDP deflator, OECD data
[5] OECD and national statistical organizations
† Small sample
* Estimated

ECSA's 1983 survey of the industry reflects these national differences. The West Germans, for example, tend to be strong in software products, which overshadow batch and remote bureau services. Harry Hoyle, a senior vice president at Quantum Science, which conducted the survey, points out that the traditionally high PTT rates depress the bureau business in West Germany. In France, where the establishment of advanced networks has received top priority from the PTT, the reverse is true. Meanwhile, in Norway, all services companies sell hardware, while in the U.K., only 55% of the services firms offer complete systems.

There are also ownership differences between countries. Some firms in countries such as Germany and Scandinavia are controlled by government agencies or special interest groups. The German Datev organization, for example, is run by a professional group of tax advisors. Meanwhile, in France and the U.K., commercial owners are more common.

"The European market is very disparate. There are gaps in each country," comments Roger Graham, ECSA's newly appointed vice president. "I hope we'll see much more cooperation between countries. We are already beginning to see that happening through the EEC's Espirit program and its pressure on governments to harmonize telecommunications, but there is still a lot to be done."

Financially, things are looking up for European services companies. In 1982 spending on computer services spurted 14%, with software products up 19% and software services (consultancy, turnkey systems, and systems implementation) up 17%. Some of this increased spending benefited Scicon, the U.K. company that is second in revenues only to IBM in the services sector. "In most areas 1983 has been better for us," says Warren Werblow, Scicon's managing director. "Our growth rate was maintained by acquisitions [Scicon owns SES in Germany and GFI in France], but growth is limited by how long you are prepared to wait before making a profit."

PACKAGED SOFTWARE BOOM

ECSA predicts that the industry will grow 11% per year over the next three years, reaching $13.8 billion by 1987. ECSA's Eyeions foresees a "massive increase" in the packaged software business, particularly for personal computers and networked applications. "All the old boundaries are falling," he says, "and the structure of the business is changing fast."

Companies offering these newer services will outdistance today's bureau operators within the next three years, according to the ECSA survey. The trade group estimates that European users spent $3.89 billion on batch and remote services and $3.88 billion on software products and services in 1982. By 1987 software products and services revenues should be well ahead of bureau services revenues, if ECSA's forecasts prove correct. Specifically, ECSA is predicting an annual 17% increase for software products and a 16% boost for software services.

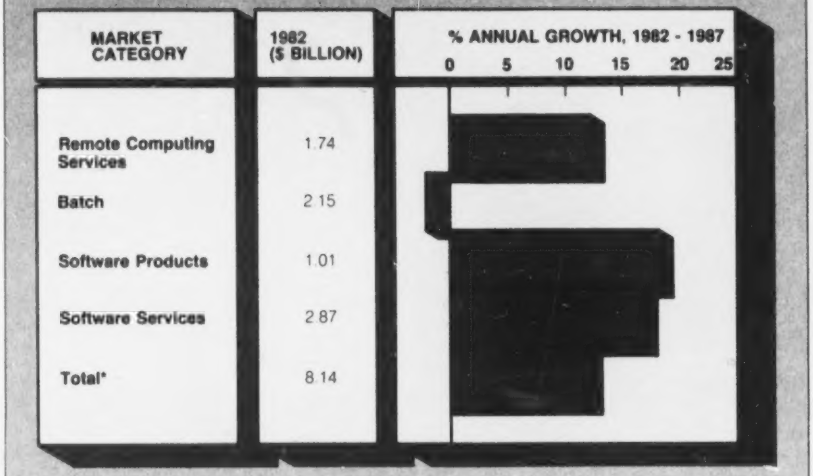
Such healthy growth was stunted during the recession, which hit the services companies harder than their hardware counterparts. "The services industry tends to link price to inflation," explains Quantum Science's Hoyle. "Hardware suppliers have not been affected in that way and have been free to respond to competition by price-cutting. But now that inflation has come down, the service element in computing is also coming down."

Hardware companies have also been attempting to muscle in on the expertise of independent software companies. Control Data, for example, snapped up U.K. banking specialist Arbat and took a $12 million stake in Digital Equipment oemer Systime. Not to be outdone, the U.K. electronics and leisure combine, Thorn EMI, acquired Altergo Software, as well as Software Sciences and Datasolve.

"Hardware suppliers will increasingly turn to the services industry either through acquisition or third-party agreements," predicts Hoyle. "There is a blurring between the hardware and software industries. Already over half of all European software companies sell equipment, and they are coming up

FIG. 3

USER EXPENDITURES ON COMPUTING SERVICES IN WESTERN EUROPE



*Includes other computing services valued at $370 million
Source: Quantum Science MAPTEK Europe.

against stiff competition, particularly in the small business area, from firms such as Kienzle and Nixdorf. They must adopt vertical market strategies."

Although ESCA says that the most successful companies are those that find an industry niche, it warns that progress will still be slow because of the strong national character of European services companies. This is confirmed by Michael Hunt, an executive vice president at Management Science America's MSA International subsidiary. A company specializing in general accounting software, MSA recently bought a manufacturing industry package. "It's been a long, hard grind," admits Hunt. "Packaged software is not always easy to design for a particular market."

At Hoskyns, which is owned by the U.S.-based Martin Marietta conglomerate, executive director Neville Cerfontyne is more sanguine. "Europe is full of multinational companies that will want to centralize their purchasing so that they can set up standard computer systems. Dealing with a multinational opens up that door to overseas sales," he declares. "In addition, we don't always work from a U.K. base. We use distributors that do the conversion, produce documentation in the local language, and so on." Some 20% of Hoskyns' revenue comes from export sales.

"The trouble with vertical markets is that they saturate very quickly," says Quantum Science's Hoyle. "Companies have got to get distribution and product strategies that take them outside their immediate location—strategies that get them away from small- and medium-sized companies and into the departments of larger companies."

In France, the services companies have seized on that exact point. Exports, which account for one quarter of all services sales, total approximately $1.5 billion. "Our overseas activities now form an integral part of our general strategy," reports Pierre Dellis, chief administrator of Syntec, the country's software/services trade association. Dellis predicts that software will account for 90% of the value of computer systems by the end of the decade.

Dellis believes the French government should recognize the significance of the software industry. But more than recognition, the industry needs support. For one thing, Dellis wants the government to include software in its export insurance scheme. At present only projects involving equipment that is 90% French-made qualify for this insurance.

France, which pulled in $1.69 billion in end-user sales in 1982, is the largest services market in Europe. In general, computer services is a very volatile business in Europe. "The way the software industry is built up means it is prone to fragmentation," explains Hoskyns' Cerfontyne. "You don't need much money to start up and every time a larger company goes bust, which is frequent, ex-employees get together and start up new companies." This hydra effect means that the smaller firms can undercut their bigger rivals, which, according to Cerfontyne, "puts an undue strain" on large companies. "You can't price-cut on people," he comments.

The overall services industry in Europe is very immature, claims ECSA's Eyeions. "Nobody has even 5% of the market and expansion is held back by the different languages, currencies, and legal systems. Even a very basic application like payroll is very hard to take across frontiers."

Despite the difficulties, most services firms are bullish about the future. "We haven't even begun to scratch the surface of the software package market," declares MSA's Hunt. "There is a tremendous replacement market selling on-line packages to firms that have homegrown systems in place."

Some of those homegrown systems are indeed ripe for replacement. That certainly is the case in Austria, where 60% of the local users have software that's over eight years old. Those statistics come from Diebold's Austrian subsidiary, which also estimates that 20% of the companies in the country are using programs that are over 13 years old.

The pickings in Austria look good enough to prompt a move westward by Hungarian services companies. The country in fact is test marketing bureau services in Austria and has already concluded deals with such companies as ICL to sell software products elsewhere in Europe.

Other marketing opportunities are also opening up around Europe. Hoskyns' Cerfontyne believes that services companies, offering a more creative range of products, will be moving into many new application areas. What's happening today, however, is a different story. The ECSA survey, in fact, highlights the current trend toward networked support services that provide such things as remote maintenance, downloaded software, and electronic mail. More important, these net services furnish distribution channels for such consumer services as banking. "The recent $10 million contract awarded to ADP in the U.S. to support International Harvester's dealers with a range of business services is indicative of the market trend," ECSA points out.

Quantum Science believes that services companies could provide networked services to computer dealers. Such services would enable dealers to select and try out software. They would also offer documentation and help facilities, supply software, and give computer aided instruction. But before these services can be furnished, "international data communications networks will have to be much easier to use," explains ECSA's Eyeions. "Before new services like these are introduced, it should be possible to access international networks without the intervention of the PTTs."

The software/services sector should also be able to take advantage of the micro movement. Hoskyns' Cerfontyne believes that less than 5% of the market for low-end business systems has been tapped so far. One company doing big business at that low end is MSA. The firm's Peachtree personal software subsidiary is currently pulling in between $5 million and $6 million in business from European microcomputer owners. (Despite these gains MSA's 1983 foreign revenues were low-

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er than expected, especially in Scandinavia.)

The new breed of nonprofessional computer user is in fact already having an impact on the services industry. Two major issues for ESCA members—data protection and copyright—are both a result of wider computer usage. On the data protection front, ECSA wants to see legislation throughout Europe so that national discrepancies can't be used as another trade barrier. Copyright is a thornier issue.

"Some of us would like to see users prosecuted for copying programs," declares ECSA's Eyeions. "It's really like people being found in possession of drugs. At the moment we are tackling the pushers when perhaps we ought to be looking beyond them to the users." ECSA is pushing for national legislation that would grant explicit copyright protection for programs. The group does not favor central registers of copyright programs, because it feels that would allow unscrupulous operators to produce look-alike programs that do not violate the letter of the law.

Meanwhile, software/services firms hoping to reap the benefits of a broader marketplace should remember that change will dictate demand. "The point is that business is dynamic," says Hoskyns' Cerfontyne. "What matters in business in the future may not matter now." Philips' Dekker also picked up on this point, declaring, "I suspect that in the immediate future it is not the strictly technological developments, but rather the developments in business organizations that will be the most important." ◆

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Assistant Art Director	Susan M. Rasco
Production Manager	Geof McDonald

EDITORIAL OFFICES: 130 Jermyn St., London SW1 4UJ, England, (441) 839-3916; telex 914911. 13 Stanley Place, Budd Lake, NJ 07828, USA, (201) 691-0592; telex 4494308.
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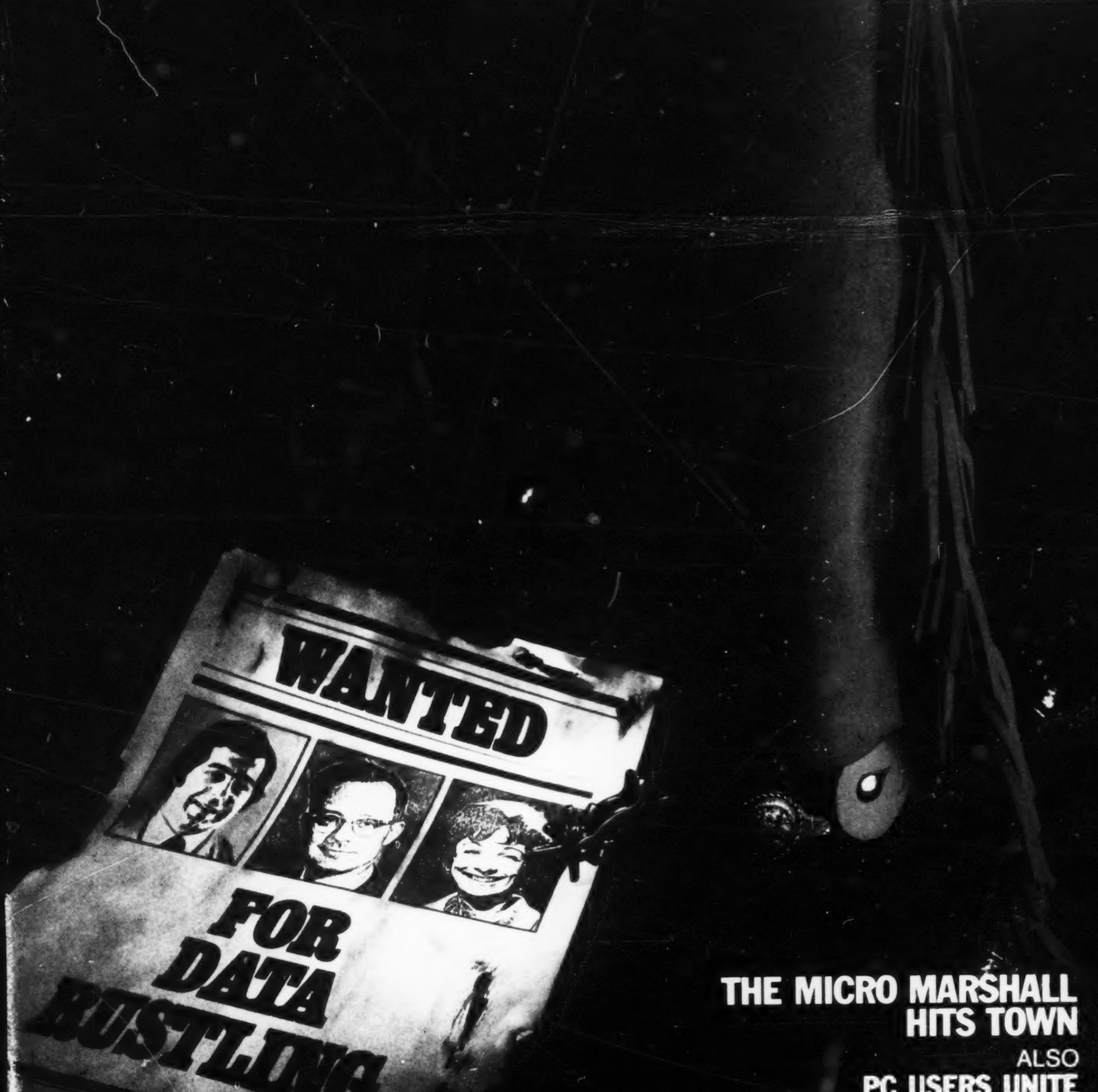
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COVER PHOTOGRAPH BY STEVE COOPER

CAD/CAM can be a golden opportunity for vendors and users alike.

THE MIDAS TOUCH IN MANUFACTURING

by Paul Tate

European industrial companies are fast discovering that CAD/CAM systems are the Midas touch they need to turn design productivity into golden profits. After a slow start, Europeans are putting cash on the line for technological tools to sharpen their competitive edge.

This trend toward automation among European industrials is creating a fast-growing market—a market that will be worth around $1.5 billion by 1987, according to California researchers Creative Strategies International. "There is now a huge wave of interest here in CAD/CAM," confirms Professor Gert Lang-Lendorff, head of the West German government's CAD/CAM laboratory in Karlsruhe. "This interest stems from a growing awareness in Europe that industrial companies must start using computers more widely to stay internationally competitive."

That awareness usually begins inside companies in the minds of management. Tim Neill, head of the U.K. consultancy CAD Source, describes the new attitude among manufacturing company managers.

"A year ago the question managers were asking was 'What is CAD/CAM?' Now they are asking 'What kind of CAD/CAM system do we need?' That is a considerable change of attitude."

Computervision's Andrew Rodgers believes there was a practical reason for this change in attitude. "The need for productivity in the industrial sector," he says, "focused the minds of senior management on the potential of automation."

Nevertheless, there is still much work to be done to get Europe's industrial sector up to speed on the technology track. In fact, at the end of 1982, only 5% of the CAD/CAM systems market in Western Europe was being satisfied, according to CSI. Over the next few years, however, the market will expand considerably. CSI forecasts annual growth rates of 38% by value and 43% by installed units through the end of 1986. CSI also predicts that the market for computer aided drafting and design (CADD) systems, which are often micro-based, will grow even faster—by around 58% in value and 62% in units by 1987. "This will give an installed base approaching 10,000 units by 1987 and a market revenue of approximately $170 million," says CSI.

Those revenues will be derived largely from West Germany, France, and the U.K.—currently the biggest national markets in Europe. The two major European CAD/CAM markets are Scandinavia, which accounted for 15% of the European market in 1982, and the Benelux countries.

Indeed, Scandinavia, despite its small population and industrial base, is one of the fastest growing CAD/CAM markets in Europe. "There is a very mature market here in Sweden," comments Nils-Holger Jansson, managing director of SMT Machine in Sweden. "There are still difficulties in evaluating the potential of CAD/CAM and there's room for more expert personnel in many industrial companies, but most organizations are aware of the new technologies, and what they can do."

SLOWER GOING IN GERMANY

In sharp contrast to Scandinavia, West Germany has been a slow mover in the CAD/CAM realm. That's expected to change as German attitudes toward industrial technology change. In fact, CSI predicts that Germany, with 32% of sales, will be Europe's largest market by 1987, when there will be around 60,000 CAD/CAM systems installed in Western Europe.

That's a lot of business for CAD/CAM vendors. An increasing number of companies, hoping to get a piece of that action, are

ENCOURAGEMENT EFFORTS

Concerned about the need to boost productivity, European governments have launched various efforts to encourage investment in new industrial technologies. One of the most ambitious programs was unveiled last year in West Germany, where the government earmarked $202.5 million for a campaign to increase R&D in the fields of CAD/CAM, robotics, and new factory automation. Under the scheme, companies get 50% funding while universities and research outfits get 100% funding on projects primarily aimed at industrial engineering development and personnel training.

Across the border in France similar subsidy programs are in the works. This support is particularly critical for the indigenous industry, which has not kept up with local demand. Indeed, the French Bureau of Information & Economic Forecasts reports that national companies are able to supply only 13% of the country's requirements for CAD systems, and only 30% of its needs for computers in industrial applications. To narrow that supply gap, the French government will dole out $13.8 million in research money over the next three years to French manufacturers of CAD/CAM systems, robots, and numerically controlled industrial equipment. Companies developing factory systems under contract will also be eligible for aid.

In 1981 the British government launched a program to increase the local manufacturing industry's awareness of CAD/CAM benefits. So far more than 18,000 firms have taken advantage of the program, which has received $15 million in further funding. Another state-backed scheme offers grants to companies wanting to buy automatic test equipment and CAD/CAM systems. Set up in 1982, this two-year, $18 million aid program has been blessed with another $7.5 million. CAD/CAM research ventures are also included in the U.K.'s Advanced Information Technology project and the European Economic Community's $1.3 billion European Strategic Program for R&D in Information Technologies (Esprit). —P.T.

FIG. 1

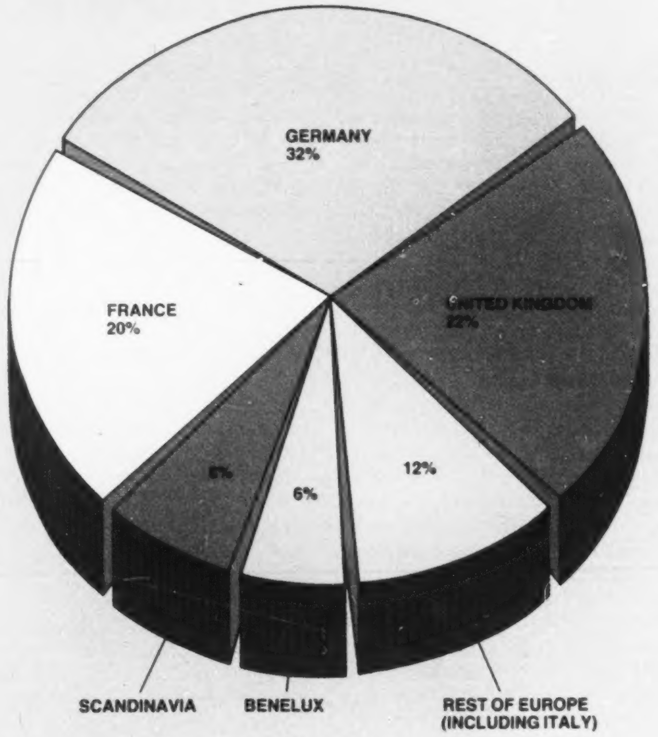
EUROPEAN CAD/CAM EQUIPMENT MARKET

Year	Value ($Million)	Annual Growth %	Units (Terminals)	Annual Growth %	Price Per Unit ($Thousand)	Installed Base
1984	556	38	6,400	46	87	20,875
1985	780	40	9,510	49	82	30,385
1986	1,092	40	14,275	50	77	44,660
1987	1,530	40	20,130	41	76	64,790

Source: Creative Strategies International

FIG. 2

1987 EUROPEAN CAD/CAM MARKET*



Source: Creative Strategies International
*Measured in revenues

entering the European arena. In the European field today there are U.S. CAD/CAM specialty firms, along with local manufacturers and software houses. Also entering the fray are the traditional computer makers.

American suppliers have dominated the world market since the late '60s, when CAD/CAM systems first became commercially available. In Europe, such U.S. companies as Computervision, Intergraph, Calma, Applicon, and Gerber, have the lion's share of the turnkey trade. All of these market leaders have a well-established presence in Europe—a presence they'd like to further enhance through local collaborations or takeovers. European software houses are a particularly good catch for U.S. vendors, since they can provide general expertise as well as local market knowledge.

One example of an American company that went the acquisition route is Computervision. The CAD/CAM king took over both Cambridge Interactive Systems in the U.K. and Grado in West Germany specifically for their software expertise.

The European vendor ranks, however, are growing. In Norway, computer maker Norsk Data is pushing into the market using its own hardware and Shape Data's Romulus 2 package. Norsk also has a research program to investigate the use of expert systems in CAD/CAM. In the U.K., which accounted for 27% of European sales in 1982, companies such as Applied Research of Cambridge, Ferranti Cetec, and Racal-Redac are building up healthy customer bases.

Still other companies throughout Europe are continuing to join the CAD/CAM cadre. Entering the market in France were Matra and Dassault. In Italy, office equipment specialist Olivetti decided to take the CAD/CAM plunge. Across the border, German giant Siemens found the field a natural follow-on product line.

Competing in the CAD/CAM market, however, may be a tough task for many of these companies. "The industrial automation market in general and the CAD/CAM market in particular are very different from the business systems market," explains Bob Bishop, international vice president of Apollo Computer. "The level of application knowledge needed to succeed in the industrial market is much higher."

For some European competitors, software may spell success. Strongly wedded to U.S. hardware, European users are beginning to look elsewhere for CAD/CAM software. Most of those select users are more sophisticated, as Apollo's Bishop points out: "There is a second generation of CAD/CAM users out there in Europe now. The level of user confidence is higher and the choice of products is wider. There is a greater readiness among users to buy hardware and software from different vendors."

Some of this readiness stems from necessity. Graphics-based CAD/CAM software, for example, must be adapted to the various European markets. This has aided the growth of a European CAD/CAM software industry, which is made up of companies that retrofit generalized software to conform to national needs. These firms also produce specialist systems for local companies.

The availability of nationally tailored packages and application-specific software products is helping open up the European CAD/CAM market. Parts of the market, of course, have been open for some time. A number of European companies were quick to catch onto CAD/CAM's potential.

EUROPEAN EARLY BIRD

One of those European early birds was British Aerospace, which automated the production of master copies of its design artwork back in 1970. In fact, most of the early CAD/CAM users were large airplane and automobile companies that could afford the heavy system costs.

Today, despite drastic improvements in the price-performance ratio of systems, many small and mid-sized European firms have still not caught on to the advantages of

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CAD/CAM. Acutely aware of this shortsightedness, European governments have launched various efforts to encourage investment in new industrial technologies (see box).

These national initiatives are not only fostering the market, they're also stimulating local developments in CAD/CAM technology. Some of this work is in areas such as expert systems, networking, and microcomputers.

The microcomputer market currently covers only CAD. Many of these existing CAD applications suffer from the performance limitations of today's micros, but these problems should be helped by the arrival of 32-bit machines. These systems, which will allow much of the existing CAD software to be downloaded from mainframes or minis, will help the micro segment of the market to grow substantially. In many applications, micros will take the place of today's specially designed graphics terminals.

Today's graphics terminals are basically standalone systems that support CAD/CAM processes such as local control of drawing commands, zoom, panning, and windowing. The future of graphics terminals, however, is closely tied to the implementation of technical standards. Core, the draft standard for 3-D terminals, has been rejected and an ANSII group is currently working on Phigs, a dynamic application program that performs hierarchial data transformations under control of a graphics generator.

One segment of the market that has yet to be satisfied is the networking of CAD/CAM systems. A study by British CAD/CAM consultancy CAD Source revealed that less than 20% of U.K. users surveyed had linked their CAD/CAM equipment to other systems. The need for networking, however, is expected to grow, since it allows designs to be transferred between systems.

In fact, networking is one of the critical factors in the integration of manufacturing systems. This concept known as computer integrated manufacturing (CIM) incorporates CAD/CAM with computer aided engineering and robotics. Standards that overcome the incompatibility of different systems are especially important for the successful implementation of CIM.

British Aerospace design manager Colin Allen, who is also president of the British Institution of Engineering Designers, believes the current incompatibility of CAD/CAM systems is a major drawback. "All the standards that now exist are relatively low level. What we need is to standardize the general systems interface. International pressure must be brought to bear on vendors to stop them from all going their own way. The CAD/CAM industry must now go along the same tortuous route as the business community has to standardize its systems. Otherwise, we as users will be held back." ◆

Some of the research for this article was supplied by Nancy Knottek, senior associate editor for international publications at Datapro Research Corp., Delran, N.J.

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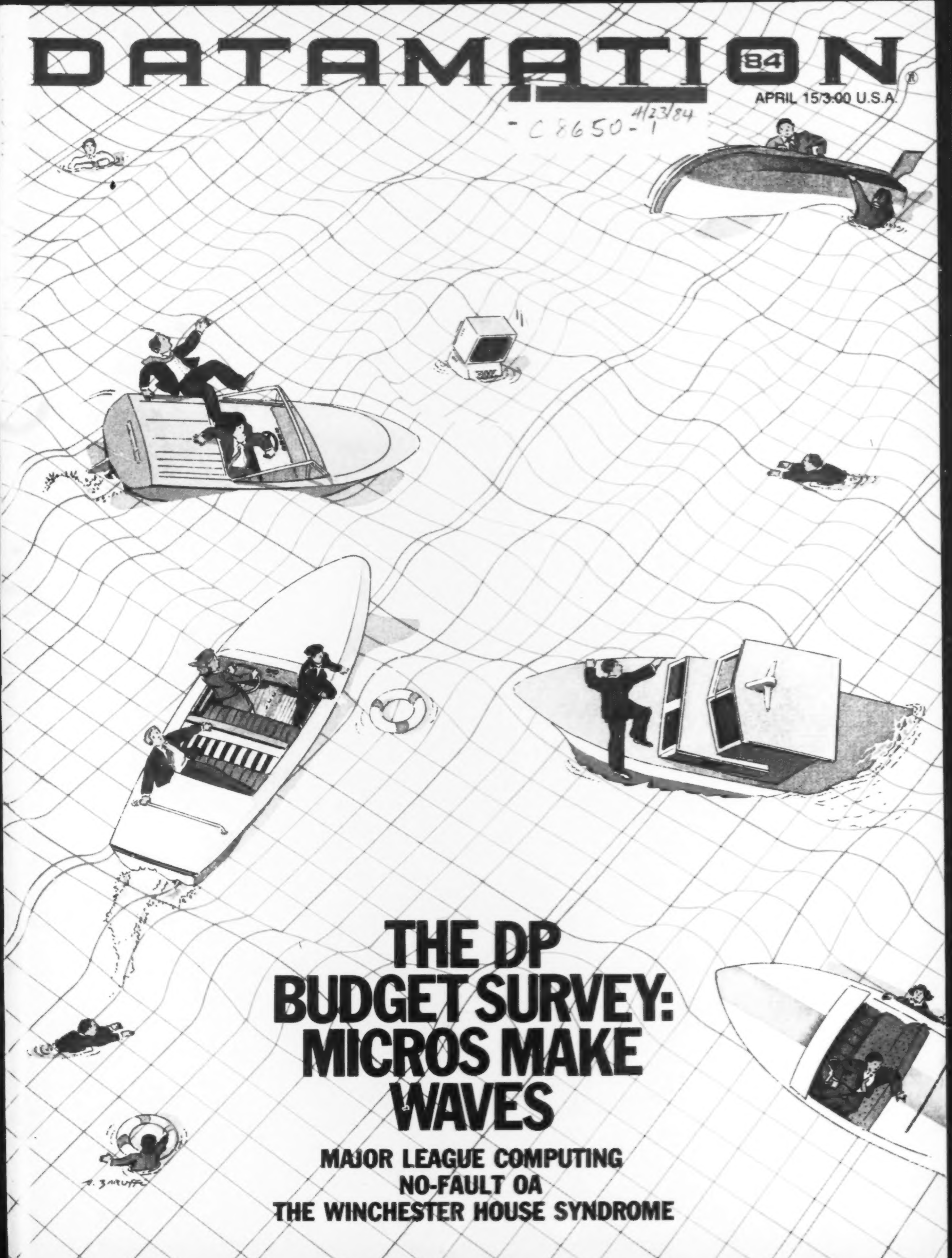

THE DP BUDGET SURVEY: MICROS MAKE WAVES

MAJOR LEAGUE COMPUTING
NO-FAULT OA
THE WINCHESTER HOUSE SYNDROME

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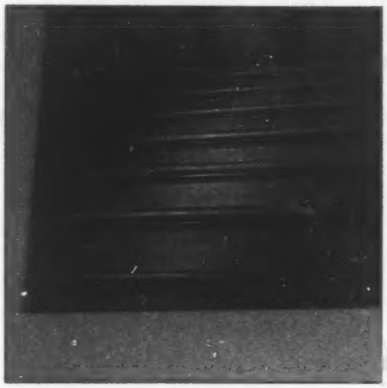

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COVER ILLUSTRATION BY ANDREA BARUFFI/
GRAPHIC BY CYNTHIA STODDARD

The ripple effects of personal computer spending are spreading throughout the shop.

THE DP BUDGET SURVEY: PCS MAKE WAVES

by Larry Marion

Several hundred lending officers, corporate finance experts, and other banking professionals are learning how to use personal computers at Continental Illinois National Bank, Chicago, this spring, not because of a virulent case of micro fever but at the behest of the data processing department. "We are unleashing 200 personal computers in the bank to cut the applications backlog," vice president for systems Edward M. Boss says with no small amount of trepidation. "We are anticipating, hoping, praying that the number of requests for mainframe data massaging will go down and we will then be able to reallocate our dp resources."

As the new move by the nation's seventh largest bank suggests, data processing managers are entering the third phase of the sometimes stormy relationship with personal computers. The first phase can be described as indifference bordering on contempt, as micros were purchased by end users without the permission or knowledge of the dp department. Phase two began when the micro users went, floppies in hand, to the dp department asking for help—access to mainframe databases, communications with other pcs, etc.—or seeking answers to questions like, "How do I copy a disk file?" Phase three, now under way at Continental and hundreds of other companies, is the active purchase of micros by the dp department to cut dp costs, increase productivity, and, in general, strengthen the corporation. The pesky microcomputer mosquito has metamorphosed into a butterfly.

Evidence that corporations are moving into phase three by the hundreds comes from a new DATAMATION survey of data processing departments. Late last year 1,083 dp managers from across the country filled out a questionnaire outlining their current budget and estimated 1984 spending. The mean dp budget increase will be 7.2% in 1984, with a range of minus 4% to 21% depending on industry. The really startling numbers, though, are those which indicate the extent of microcomputer spending by the dp department: for every dollar that a dp manager will spend this year on mainframes, another 50 cents will be spent on personal computers. In other words, mean spending for mainframes was 10.1% of the total budget, compared with 4.9% for personal computers.

RIPPLE EFFECT IN BUDGET

Furthermore, the rise of the micro on the dp manager's shopping list has ripple effects throughout the budget. Spending for personnel, outside services, and other hardware categories is under pressure, at least in part because of the influx of personal computers from IBM, Apple Computer, and dozens of other companies. "Personnel used to be one third of the Continental's dp budget, which is $115 million this year," explains Boss, "but it is now about 45%. We hope it will plateau at that level, and then decline if the pc phenomenon really takes off."

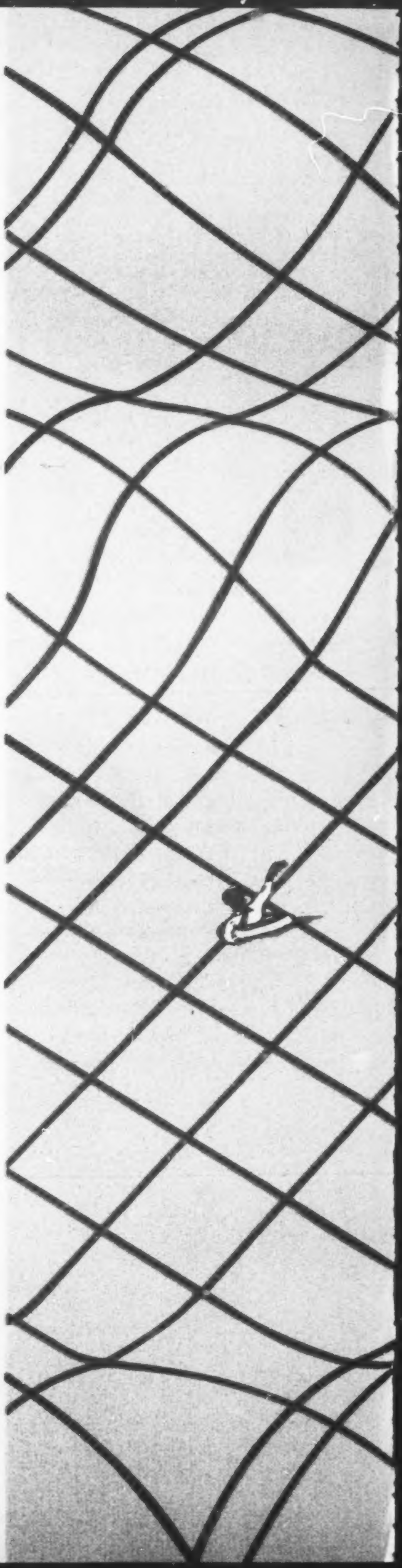
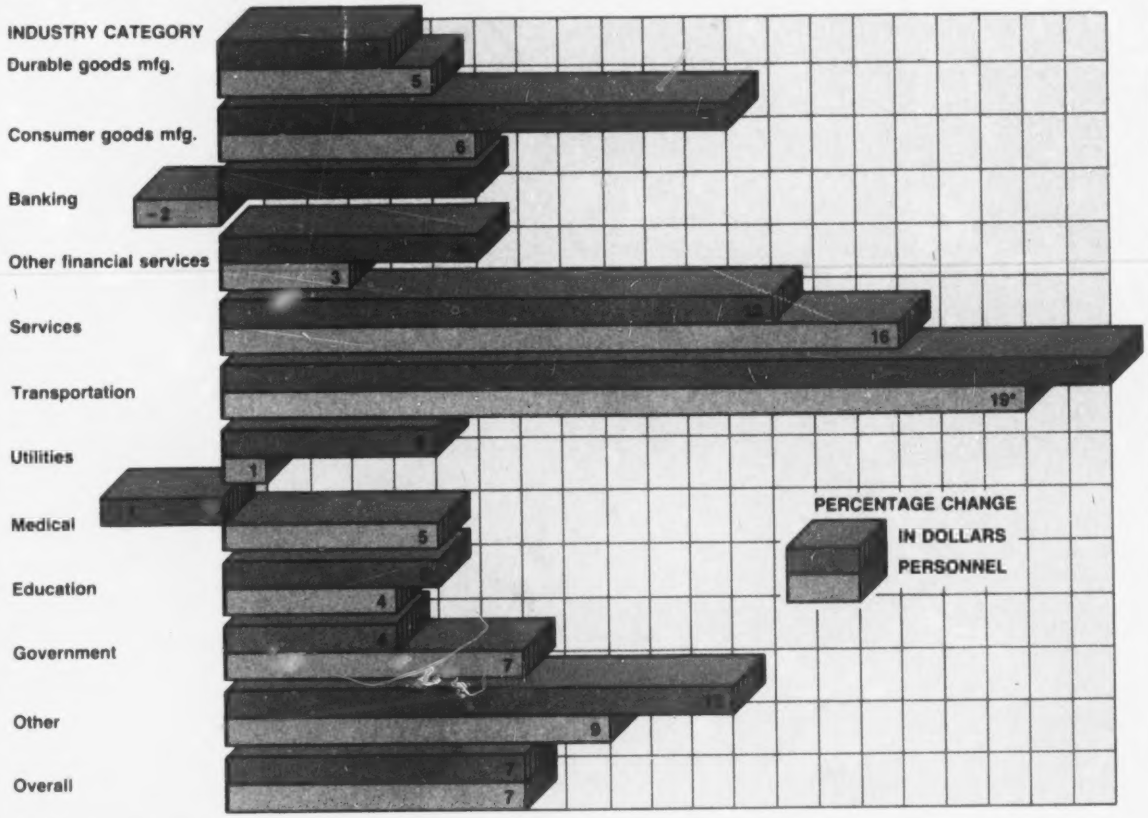


ILLUSTRATION BY ANDREA BARUFFI

FIG. 1

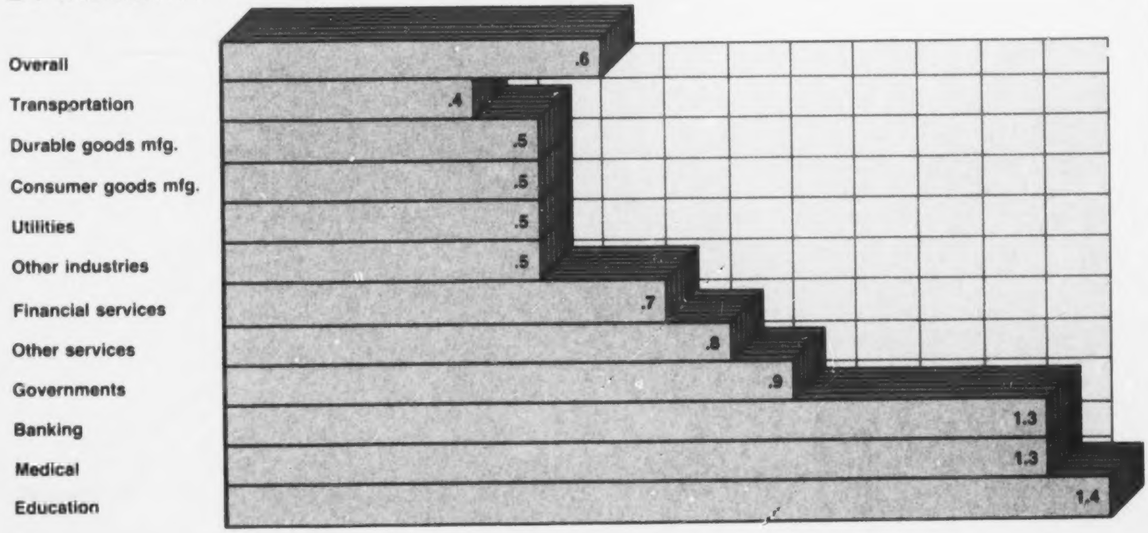
1983 VS. 1984 DP DOLLARS AND PERSONNEL BUDGET CHANGES



*Only 19 companies report

FIG. 2

DP BUDGETS AS PERCENTAGE OF REVENUES, BY INDUSTRY



THE BIG PICTURE

Determining data processing budget priorities must make MIS managers feel a little like President Reagan confronting the federal budget—there are few real choices when it comes to priorities. In Washington these days the Social Security Department budget is sacrosanct, and dp managers know that cutting the personnel ranks is impossible. Each line item in the federal or dp budget has its special interest groups fighting to increase its funding and prevent cuts. "MIS managers have had to make some hard choices," notes David Dell, director of research services for dp consultants at The Diebold Group, New York City.

Coming out of the 1981–82 recession, dp managers were able to achieve modest gains in the budget. All but one industry category show increases for dp spending (see Fig. 1). The 7.2% average masks the wide differences in the average rate of increase, from minus 4% for medical centers to 21% for transportation firms. The variation reflects the differing rates of recovery in sectors of the economy.

The 12% increase in dp spending by consumer goods manufacturers reflects sharply increasing revenues from sales of automobiles, appliances, clothing, and other personal items. As employment increases and unemployment declines, consumer spending soars. The companies that make the machinery used by consumer goods manufacturers won't see a surge of orders until the car and appliance factories are capacity constrained. The 3.8% increase in dp spending in 1984 by the durable goods companies will pale beside the increases expected in 1985.

The anomaly in the survey was the medical sector. The estimated 4% decline in data processing budgets may not reflect what those dp managers think will happen this year, but what they told their bosses. "Due to new government policies on cost controls, many hospital administrators made blanket statements to cut costs by a certain percentage across the board," explains Sheldon I. Dorenfest, a medical technology consultant in Highland Park, Ill. "We don't believe that they will be able to reduce their costs. For the hospitals that do their own systems development, their budgets will definitely increase, but at a slower rate than in the past. They may be answering the questions with their wishes and hopes, but the results will be different."

At the same time that dp managers are juggling the cost cutting directives, the computer center is being viewed as an increasingly important part of the organization's strategic planning. Information processing is a new mandate that forces the dp manager to shoulder a whole new set of responsibilities, and sometimes a small increment in funding.

The traditional measure of dp's importance to the overall organization is dp spending as a percentage of total revenues. The 1% of total revenues guideline reflected industrial organizations, with financial institutions at a higher level and low-tech fields like food wholesalers at the lower end of the spectrum, say .3%. Because of the statistical bias of the DATAMATION survey sample—50% of the dp shops were small, with an annual budget of $500,000 or less—the dp spending percentages in the table underestimate spending at large organizations. Adding three or four tenths of a percentage point to the figures in the chart will indicate the kind of dp spending that goes on in large companies with large dp centers.

Indications that the 1% tradition is now on the low end come everywhere. "The average large brokerage firm spends 2% of its revenues on dp in a typical year, but 1983 wasn't typical," explains a highly regarded dp consultant to Wall Street. "The boom in sales in much of '83 was not matched by huge spending increases becaues it takes a while for equipment to be delivered and installed. That's part of the reason why the industry made sinful profits in 1983—some of the dp costs didn't show up until this year." Securities firms such as Merrill Lynch and Shearson are spending hundreds of millions of dollars on new computer centers to handle the growing load of transaction processing requests, resulting in part from the increased stock market trading. Only a few years ago the industry thought that its dp capabilities were more than adequate, with on-line systems capable of processing the trading of 150 million shares a day on the New York Stock Exchange. Within six months of the bull market last year, plans were under way to increase capacity by 67%, to 250 million shares over the next few years.

In the past, Wall Street added clerks to handle the paperwork blizzard, but employment ranks are not growing as fast as in earlier boom times. Dp spending has increased at a 20% annual clip for the past four years, though. "Nowadays more and more of the costs of running the house are embedded," notes the MIS vice president of a major New York brokerage firm. "You can't lay off computers, like you could lay off clerks in the old days."

The rising importance of MIS is seen even in areas once considered to be dp backwaters. Stephen Adams of Jewel Cos. in Chicago says that dp spending, currently more than $20 million, is rising at a faster rate than revenues because "there is an acknowledgment that there is leverage to be gained with information." Using the product sales information stored in the checkout counter scanners is a tempting target of the new information revolution at the supermarket, he suggests. "We are trying to find ways of using the information."

—L.M.

Investment in personal computers now ranks as the fifth largest spending item, after personnel, mainframes, minicomputers, and supplies. It may seem hard to believe, but in general, the mean budget allocation for personal computers now exceeds that of terminals, desktop systems, or mass storage devices and is triple the level of 1981.

The absolute numbers are not as absolute as they look. Several reasons account for this. Some dp departments do not have a pc budget category, as the expenditures are funded out of end-user budgets. The numbers do give a strong indication, though, of a trend toward consolidation of micro hardware already in the company: the 4.9% overall mean for pc spending in 1984 is the same level as in 1983. "1984 will be a year of digestion," claims David Dell, director of research at The Diebold Group, New York. "Dp managers are trying to figure out what they want to do and present a long-term plan because the numbers are getting so large. It is harder to justify the ad hoc spending of the past."

Spending for pcs and the degree to which they are acknowledged as friends, not foes, of the dp department, varies from industry to industry, but evidence of the new pc-dp relationship permeates the corporate landscape. "Between now and 1990," forecasts Dell, "corporations will spend between $12 billion and $20 billion on personal computers." A few examples:

- An estimated 25% of all potential users in the securities brokerage business are already sitting behind a PC, Apple, or Clone keyboard, according to industry observers, and corporate purchases are starting to supplant out-of-pocket spending by brokers, investment bankers, and other financial industry professionals. "There is this incredible infection of micros in our industry," gushes Pim Goodbody, Jr., vice president of the Securities Industry Association (SIA), New York City. "It is going like gangbusters." At a recent SIA conference on micros, rumors swirled around the exhibit hall that industry giant Merrill Lynch & Co. would buy an IBM PC for each of its 10,000 brokers not already equipped, beginning in 1985.
- "Hospitals had been slow to pick up on the use of personal computers, but that is rapidly changing," contends Sheldon I. Dorenfest, founder of dp facilities manager Compucare and now head of a medical technology consulting firm in Highland Park, Ill. "Personal computers are having a tremendous impact in hospitals. There is a recognition by dp managers that they are an inexpensive solution to intradepartmental needs and enable hospitals to defer big cpu purchases."
- Areas once considered dp backwaters, such as wholesalers and retailers, are rapidly gearing up. "We are spending a sig-

Merrill Lynch may buy a PC for each of its 10,000 brokers not already equipped.

nificant amount of money towards understanding how pcs can be used in stores," says Stephen Adams, corporate vice presdent for information systems at supermarket and drug store chain Jewel Cos. Inc., Chicago.

MICROS SWEEP DP DIVISIONS

It becomes apparent then that microcomputer investments by the dp department are more than just a narrow-minded pursuit of lower labor and equipment costs. An all-encompassing productivity enhancement mission by the entire corporation is being implemented with micros. The impact of pcs on white collar productivity has now swept up the dp department. "Our rule of thumb three years ago was that a simple machine with VisiCalc would pay for itself in six weeks to three months," recalls John Gosden, vice president and technology officer for the Equitable Life Assurance Society of the United States, New York City. Last year Equitable bought 200 IBM PCs for its agents and middle managers, and another 200 are on order for 1984. A typical productivity and efficiency benefit: the end of the year closeout of the books was a nightmare of late night sessions with a pencil and a spreadsheet, but no more. With Lotus Development Corp.'s 1-2-3 integrated spreadsheet package and the PCs, the numbers from the various offices are consolidated without the aggravation of the past.

Increased productivity also comes from the pc effect on the invisible backlog—the data processing jobs users never bothered requesting because the computer center was always two years behind schedule. "Projects done with pcs were never done on the mainframe because users couldn't get the dp shop to produce," concedes Robert E. Kistner, vice president of information systems and services at Combustion Engineering, Stamford, Conn. "So 1-2-3 has done a lot of things to improve the productivity of people" (see "The Micros vs. the Applications Logjam," January, p. 96).

Dp managers who previously fought against the arrival of an IBM or Apple now concede that, for the good of the corporation, end users should be given the opportunity to muddle through poor documentation, to troubleshoot bugs, and to endure the tedium of source data entry. Says the MIS vice president of a major New York City financial services company, "We are discouraging the sales force from buying personal computers because we can give them personal *computing* without the hassles of a pc, but we would rather have them buy a pc than use pencils."

Of the industry segments where pc spending continues unabated, nowhere is the frantic rush toward the "one person, one box" goal more pronounced than in financial services. The 7.4% of their budgets set aside for pc spending puts the little number crunchers at the same priority level as minicomputers and just a shade under the position of mainframes. Productivity and cost control are only part of the explanation for Wall Street's pc bullishness.

FIG. 3

THE TYPICAL DP BUDGET

BUDGET ITEM	PERCENTAGE 1983	1984
Mainframe cpus	11.1	10.1
Minicomputers	9.4	8.4
Mass Storage	3.0	2.9
Terminals	4.7	4.5
DeskTop Systems	2.0	1.7
Personal Computers	4.9	4.9
Consultants	1.8	1.6
Outside Services	4.3	3.3
Data Communications	2.7	2.9
Applications Software	4.3	4.6
Systems Software	2.6	2.8
Supplies	6.2	6.1
Personnel	29.4	28.4

Note: Percentages do not add up to 100 because of "other" components of dp budgets not specified, such as cost of energy and office space.

In the past year or so, brokerage firm managers realized that they were in a pc race in the intense competition for the best securities salesmen. Offering to buy a computer for a salesman is now an important inducement. "The firms must work to get salesmen and keep them, and part of the job requirement is for technology," notes Goodbody of the SIA. "Firms are trying to do a lot of things to keep people, and having to keep up with the technology to keep people is sending shivers through the executive ranks." They keep writing the checks, though.

The impact of personal computers on the rest of the dp budget menu is graphically illustrated by the sharp drop in the portion of spending for minicomputers. In the financial services sector, the minicomputer line lost four percentage points, to 7.4% of the total budget. This was the largest single change in the dp budget universe. Part of the change can be attributed to shifting technology—while a Tandem fault-tolerant processor may appear to be a minicomputer in a dedicated transaction processing application, a string of 16 Tandem processors cannot easily be called a minicomputer. "At that point, it's a hell of a machine," says a Wall Street MIS executive. "Meanwhile, traditional minicomputer applications can be embodied in high-end micros like the Motorola 68000, while a VAX 11/782 solves mainframe problems."

At Coulter Electronics, Hialeah, Fla., MIS director Michael DiBeneditto reports that several minicomputer-based applications are being transferred to either micros or mainframes. Records of a leasing subsidiary are moving to a micro, while general data processing chores are being restored to a mainframe after several years on a distributed dp network. "We save money with centralized applications," he explains, "even though it makes for a higher terminal budget."

Technological evolution is also behind the decline of the minicomputer. Ddp, timesharing, and other network approaches to computing power are an anachronism, notes the New York MIS executive. "They were created when cpu power was expensive and communications cheap, but now the scarce resource, MIPS, is common and the other is dear." And while many large corporations equipped their information centers with minicomputers to handle the load of end-user applications requests, a shift to higher capacity mainframes is under way to accommodate all the computer curious popping out of the woodwork. "The minis that ran our info centers are inadequate for the role, and are being replaced with mainframes," notes Gosden of Equitable Life.

The technology evolution of lower-priced cpus also continues to eat away at the service bureaus, despite their efforts to join the microcomputer bandwagon ("Bureaus Sell Micros," April 1983, p. 134). "We've pretty much stopped using remote computing services," remarks Kistner of Combustion Engineering. "Most of our work is now done in-house, and pcs will help stem the tide still further." Adds Gosden of Equitable Life, "Pcs may have eaten severely at our timesharing budget." Apparently Equitable is profiting from pcs in two ways–its employees are working at home on their "off hours" and using relatively cheap pc power instead of expensive computer time. "Once people are on pcs, they do not want to deal with outside vendors," explains Nick Martino, manager of systems planning at Raymark Corp., Trumbull, Conn. "They just want to tinker with the numbers on their own."

HOSPITALS INVEST IN SYSTEMS

Overall, service bureaus enjoyed a 4.3% chunk of the mean dp budget in 1983, but that segment shrinks to 3.3% this year. Personal computers are only part of the story. The most dramatic decline in outside bureau spending—more than two percentage points—occurred in the medical sector, which nevertheless continues to be one of the biggest users of such services. "More hospitals are trying to

"Fifteen years ago we had 80 people doing data entry. Now we have 20."

FIG. 4

PERCENT CHANGES IN DP BUDGET ALLOCATIONS, 1983 TO 1984, BY INDUSTRY*

BUDGET COMPONENT	OVERALL		DURABLES		CONSUMER		BANKS		FINANCIAL SERVICES	
	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984
Mainframes	11.1	10.1	11.3	9.4	12.8	11.7	12.5	13.6	9.0	7.6
Minicomputers	9.4	8.4	9.6	8.4	7.9	7.2	4.1	4.4	11.5	7.4
Storage	3.0	2.9	3.5	3.9	2.5	2.5	3.7	3.9	2.8	2.8
Terminals	4.7	4.5	5.1	4.5	3.6	3.0	3.5	4.0	3.8	3.5
Desktop Systems	2.0	1.7	1.4	1.4	2.4	1.9	.1	.7	2.0	2.8
Personal Computers	4.9	4.9	3.2	3.4	2.4	2.7	1.0	1.4	6.7	7.4
Consultants	1.8	1.6	2.0	1.6	1.2	.8	3.7	3.8	1.4	1.3
Outside Services	4.3	3.3	2.9	2.3	3.3	2.0	2.6	2.6	6.2	5.1
Data Communications	2.7	2.9	3.1	2.9	3.4	3.0	4.8	5.4	3.5	3.8
Applications Software	4.3	4.6	4.8	5.0	4.9	4.2	3.4	4.8	2.9	4.2
Systems Software	2.6	2.8	2.9	3.1	2.2	2.1	1.9	2.0	2.9	2.8
Supplies	6.2	6.1	6.5	6.0	7.4	7.7	6.5	7.1	6.4	7.5
Personnel	29.4	28.4	29.0	28.0	32.1	31.4	27.8	29.0	23.5	25.1

*Budget percentages do not add up to 100 because of to deletion of miscellaneous categories like energy and office space costs.

FIG. 5

ESTIMATED DP SPENDING OUTSIDE OF DP BUDGET

	PERSONAL COMPUTERS	OTHER H'WARE	S'WARE	PRO-GRAMMERS	SERVICES	CONSULT-ANTS
Mean	$64,800	82,300	47,100	59,200	72,400	34,900
Median	$17,500*	25,000	7,000	25,000	24,000	17,500

*Approximate

bring things in-house," explains consultant Dorenfest, as new government regulations further tighten the purse strings of hospital administrators. Hospitals are big users of remote services because of their large system and complex software requirements. As cpu costs decline and the volume and quality of hospital management software increase, more hospitals are making the internal investments. Software spending by hospitals will increase to 7.1% of the 1984 budget from 6% last year (see Fig. 1). "Until recently, the movement toward in-house systems was slowed by the lack of good software, but that is changing," he says, and predicts an accelerating decline for outside services, based on a survey of 250 hospitals.

Changes to the portion of the dp budget devoted to personnel stem from a number of factors, and the microcomputer invasion cuts both ways. Managers and professionals analyzing data on terminals, desktop office automation systems, or pcs are rapidly depleting the data entry ranks. "Fifteen years ago we had 80 people doing data entry," relates W.F. Weprin, manager of information sytems for Peoples' Gas, Chicago. "Now we have 20 people and it's declining fast, as we make more and more use of source data entry." Adds Dell of The Diebold Group, "There are far more people doing data entry now than in the past, but they are not in the dp department."

And, as many dp managers feared, while phase two of the microcomputer influx progresses, demands for help from new end users leads to more, not less, personnel expenses in the short term. "It is taking me more time to service these people," cries Martino of Raymark. He rapidly ticks off the costs of new personnel: "I need a systems programmer to answer questions, an applications programmer for downloading data, and a trainer. And, to top it all off, I'm starting to see more end-user requests for highly specialized data crunching programs." As his pc users explore the powers of an electronic spreadsheet on a microprocesor, they approach the limits of capacity relatively quickly. Then they come to him. The New York City MIS vice president sums up the phenomenon by saying, "The dp center is losing a lot of the simple applications development requirements to end-user microcomputing, but gets stuck with all the big problems."

To avoid the expense of adding systems development programmers and analysts and inflating the personnel costs, many dp managers are flocking to canned software and applications development tools. The applications software budget component is rising to 4.6% of the 1984 total from last year's 4.3% because it is cheaper to buy a package than to built it from scratch, according to some.

"In three years nobody will be doing program development work," declares Kistner of Combustion Engineering. "Due to the modular nature of fourth generation packages, it is easy to modify them for customized services. I can't afford to create from scratch an MRP program or other general purpose applications software. The days of the $4 million to $5 million cost of homegrown software are over." While others disagree, saying that the cost of modification and customization necessary to match a product to a company offset the initial purchase price, Kistner is the first to admit that some of the productivity aids on the market are less than ideal. "The advent of VM/CMS to improve program testing hasn't had a hell of an impact on code costs," he says. "If you look at total system development costs, the savings haven't occurred."

General business conditions are leading to the soaring software budgets in certain industries facing new markets and competitors. Banks can now sell stocks, and stockbrokers have offered quasi-savings accounts for several years, so the software budgets and software development personnel rosters are

OTHER SERVICES		TRANSPORTATION		UTILITIES		MEDICAL		EDUCATIONAL		GOVERNMENTAL		OTHER	
1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984
5.9	6.2	11.1	9.9	18.2	15.2	13.1	12.1	11.8	10.8	15.1	13.5	9.9	9.3
9.4	7.2	10.7	7.6	4.5	4.2	9.8	8.2	11.9	11.0	7.0	7.9	10.3	9.9
2.4	2.5	3.3	3.0	2.1	3.1	4.7	4.0	3.0	2.0	3.2	2.9	2.8	2.6
5.6	4.7	6.6	5.6	6.0	7.7	4.0	3.8	3.9	4.3	6.6	5.9	3.9	4.0
2.3	2.4	.1	.1	.1	.2	.4	.4	1.7	1.6	1.5	1.6	3.5	2.3
9.9	9.1	.5	.5	.7	1.8	3.0	1.8	6.0	5.5	2.4	3.1	6.3	6.6
1.4	.9	1.8	1.6	1.1	.8	1.5	1.3	.7	1.0	1.0	.7	2.8	2.6
4.4	3.5	4.3	1.8	1.1	1.4	12.8	10.5	4.1	2.5	7.2	5.7	3.1	2.6
2.8	3.1	2.1	2.6	1.7	3.0	1.7	1.5	1.6	2.1	3.3	3.2	2.5	2.8
6.1	5.1	2.5	2.8	5.4	4.1	4.3	4.6	3.4	4.3	4.3	4.6	3.7	4.6
2.9	2.7	4.4	5.5	3.5	3.3	1.7	2.5	3.0	3.5	2.7	2.5	2.2	2.5
5.8	6.4	4.9	4.6	7.2	7.6	4.8	4.4	8.3	8.2	4.8	4.8	5.6	5.3
27.9	27.3	38.2	33.0	28.2	27.3	30.6	27.2	29.1	26.6	30.7	30.8	29.3	28.2

climbing faster than the federal deficit. "In banking, we have to stay competitive, so to be on the leading edge we have to develop software internally," explains Ed Boss of Continental Illinois. The mean applications software budget allocation for financial services companies responding to the survey was 4.2%, up about 50% from the 1983 level; for banks, the increase was almost as large. Similarly, personnel costs are also up a few percentage points.

REDUCING SUPPLY COSTS

Pressure to control costs during the recession and in the current drive for profits is focusing much attention on a more mundane topic than microcomputers or software productivity aids. Dp managers report a growing effort to control the cost of paper, ribbons, magnetic media, and other supplies. A slight decline in the portion of the total dp budget going to the vendors, reported by the survey respondents, is the result of a variety of housekeeping efforts.

Kistner of Combustion Engineering reports a 15% to 20% savings on corporate paper costs by arranging for volume purchases from a limited number of vendors. Weprin of Peoples' Gas says he cut the corporate computer paper budget by 50% by installing duplex printers. And anybody looking for a roll of 8½ by 11-inch printout at electrical equipment maker Square D of Palatine, Ill., will have a hard time finding one. Manager of MIS administration John Stenger cut back on the number of inventory items in his supply rooms last year, dropping the standard-size paper. Volume purchases of the longer 8½ by 14-inch forms saves the company money, though it must make the letter-size file cabinets a bit bulkier. His defense: "Supplies are a variable expense and we generate a copious amount of paper reports."

Mandates to cut costs, trim supply budgets, and substitute source data entry for a legion of clerks reflect another aspect of dp spending—the rising tide of off-budget payments. While a 20% rule of thumb was evident a few years ago, the average organization's outside spending is expected to reach about a third of the mean dp budget of almost $1 million this year.

There is some good news for dp executives watching the flood of dollars outside of their realm: the outflow for pcs may be slowing down. Dell of Diebold estimates that the ratio of outside pc spending to the dp budgeted amount was about eight to one, but the DATAMATION survey indicates that the ratio is more like three to one this year. The discrepancy may, in part, result from the broader horizon of 1,083 users vs. the Fortune 500 focus of the Diebold studies. Indeed, the median spending level of pcs, outside of the dp budget, was about $17,500, or substantially less than the amount allocated in the mean dp budget. Subtract the personal computer from outside spending and the total falls back into the 20% level.

A smaller but significant reason for the sharp increase in off-budget spending comes from the cost of applications software. Many dp shops are not mandating which spreadsheet, word processor, or database management package must be used. "We may be spending more than we need for outside software, but the alternative, hiring a staff to evaluate packages, would result in diseconomies," notes the MIS vp of a major New York brokerage firm. The large majority of survey respondents guessed that outside applications software spending runs at least $7,000, while the mean figure of $47,100 reflects the huge costs of mainframe- and minicomputer-based packages for manufacturing, medical, and other specialized applications.

It would appear that with all the indirect costs of personal computers, peripherals, software, and supplies paid by end users, the average corporation, university, or other organization is collectively spending more on microcomputers than on mainframes this year. That's not happening, of course. IBM's 308X models are not taking a back seat to PCs. The mean numbers do not reflect the fact that there are hundreds of dp shops without a mainframe budget item, or, for that matter, a personal computer category. Among the shops with mainframes, the median budget segment is about 20%. But the trend is crystal clear—personal computers are making w in the dp budget pool. ◆

The 1984 DATAMATION budget survey is for sale in report form. It contains 78 pages of statistics and an executive summary prepared by the Market Research Department, covering 1,083 data processing center sites in 12 industry categories and including spending priorities for 13 different dp budget items. Single copies are $100. For more information, contact Laurie Schnepf, Research Director, Technical Publishing Co., 875 Third Ave., New York, NY 10022.

There can be a lot more power in the promotion than there is in the program.

THE SELLING OF SOFTWARE

by Efrem Sigel

When the 100,000 subscribers to PC *World* opened their November Software Review issue, they found an unusual insertion: a bound-in envelope containing a sample disk for Microsoft's just-released word processing program, Microsoft Word. Determined to crack one of the key micro software applications markets, the Bellevue, Wash., software house figured it might as well put the program itself into the hands of its prime audience: owners or would-be owners of the IBM PC. This kind of mass sampling had never been done before, and with good reason: not only were there production problems in binding the disk into the magazine, but the cost of disks and advertising space came to an estimated $350,000.

Yet Microsoft didn't stop there in its effort to launch a winner. Since October it's been running weekly five-column ads in the *Wall Street Journal* with the headline, "Stop Feeding Your Computer Junk Food." The ad, which shows a floppy diskette tucked into a bag of french fries, derides competing programs and immodestly contends that "From the first day you feed it Word, your pc will jump into high performance." On a national basis, the *Journal* ad costs Microsoft a cool $45,000 per throw. To make sure that nobody misses the message, Microsoft's ad agency, Keye/Donna/Pearlstein, also scheduled placements in *Byte*, *Infoworld*, and various business publications.

When all is said and resaid, the advertising and promotion launch of Microsoft Word won't be far from a million dollars, probably double what it cost to develop the program. This ratio of promotion to development budgets is becoming standard practice in the business software market these days.

Sorcim, San Jose, Calif., with about $10 million in annual sales, spent $1 million in just three months this fall to introduce SuperCalc3, the latest and most souped-up version of its spreadsheet and graphics program.

VisiCorp, also of San Jose, is locked in a battle with Microsoft and Quarterdeck Office Systems, Santa Monica, Calif., for leadership in the emerging windows software field. The company said it was budgeting several million dollars for the advertising/promotion of VisiOn. That is on top of the $10 million that VisiCorp already laid out to develop the program.

Lotus Development Corp., Cambridge, Mass., which started the present promotional war with its multimillion dollar launch of 1-2-3 early in 1983, has continued to spend heavily: its measured advertising just in computer and trade periodicals came to well over $2.5 million for the year. By contrast, Lotus's total development expenditures for 1-2-3 were under $1 million, based on figures from its prospectus.

Clearly, Silicon Valley has discov-

FIG. 1

CUMULATIVE SALES FOR BEST-SELLING BUSINESS SOFTWARE PROGRAMS THROUGH 1983

PROGRAM	PUBLISHER	CUMULATIVE SALES
WordStar	MicroPro	800,000
VisiCalc	Visicorp	700,000
SuperCalc	Sorcim	350,000
PFS:File	Software Pub. Corp.	250,000
dBASE II	Ashton-Tate	150,000
Total		2,250,000

Source: Communications Trends Inc.

FIG. 2

BUSINESS/PROFESSIONAL SOFTWARE PURCHASES, 1981–84

	1981	1982	1983	1984P
		(in $ millions)		
Customer purchases	$140	$430	$936	$1,638
Publisher receipts	70	215	468	819

Source: "Business/Professional Microcomputer Software Market, 1984-86," Communications Trends Inc./Knowledge Industry Publications

The output of new titles far exceeds the abilities of retailers to stock, reviewers to review, and customers to buy.

ered—some would say fallen in love with—Madison Avenue. It's gotten so that every respectable software company needs two things: a multimillion-dollar injection of venture capital, and a multimillion-dollar ad campaign. The newly raised equity disappears so quickly into glossy magazine spreads that it surely won't be long before promoters put together a new kind of tax shelter, the limited partnership for software advertising, not software development.

Perhaps it already exists. Quarterdeck raised $5.8 million in venture capital in December for its DESQ, a windows package that competes with VisiOn, and promptly announced plans to put $3 million into marketing, of which $2 million will go for advertising. Ovation Technologies, Norwood, Calif., raised $5.5 million early this year for its highly touted integrated software package. Ovation plans an ad and promotion campaign in 1984 that will cost about $5 million, according to communications director Mark Minkin. One can only hope that when the ad directors, agencies, and media are through divvying up the spoils of these new offerings, there are a few pennies left. If so, they can be used to perfect the much-ballyhooed programs that were, in theory, the reason for these companies getting started in the first place.

It doesn't take great insight to observe that the microcomputer software industry is in the throes of a marketing revolution. The question is, will that revolution take the business to a new level, or will it wind up burying some of its most fervent proponents?

A MOST INGENIOUS PARADOX

A curious paradox is at work in the micro software field: on the one hand, the industry exhibits some of the trappings of a mass market; on the other, it continues to be a highly defined specialty business. The mass-market characteristics stem from the high unit sales being recorded by the best-selling programs. As of the end of 1983, five programs among them had sold more than 2.2 million copies, with the leader, MicroPro's WordStar, passing the 800,000 mark (see Fig. 1). In light of such sales, worth hundreds of millions of dollars, it is all too easy to lose sight of a fundamental fact: such programs are bought and used by a small minority of the adult population. While the audience is primarily business-oriented it is also composed of devoted personal computer users.

The reasons for the infatuation with marketing and advertising are understandable, which is not the same thing as saying they are valid. These reasons include the rapid growth in microcomputer sales and the attendant explosion in the number of available products; the peculiar economics of the software business, with its very high fixed costs and very low variable costs; and the sudden emergence of intermediaries (distributors and retailers) that exercise great influence over what is sold.

Microcomputer software sales have grown so rapidly that there has been a stampede of new companies—and new programs—into the market. Estimates from a recent study by Communications Trends, the Larchmont, N.Y., computer publishing industry analysts, shows that customer purchases of business/professional micro software totaled $936 million in 1983, up from barely $140 million in 1981. This year, purchases should reach $1.6 billion (Fig. 2). Publishers net only half of what customers spend, because of the high level of discounts to intermediaries.

As rapidly as the market has grown, the supply of products has grown even faster. No one can say what the output of new titles is, except that it far exceeds the ability of retailers to stock, reviewers to review, and customers to buy. Peek into the office of a software review editor at any computer magazine; you will barely see the floor for the stacks of new boxes, new manuals, and new disks that arrive daily. Talk to Softsel, largest of the independent software distributors, and you learn that it gets more than 300 new program submissions a month—and takes on only a few dozen new products. Visit a computer or software store and count the number of different programs on the shelves—it's the unusual retailer who can carry more than 200, and hardly anyone carries 2,000. Yet the count of programs that are commercially available already exceeds 35,000.

My guess is that the growth rate in title output is double the growth in industry sales, i.e., although software purchases are forecast to increase by 75% in 1984—which would be down from 1983's growth of 118%—the growth in number of programs will be more like 150%. Publishers have an ever more difficult time bringing titles to the attention of distributors, retailers, customers. Increasingly, the response is to turn up the marketing flame to try to buy that attention.

The drive to spend more affects the established publishers every bit as much as the newcomers. The last thing an established software company wants is to be knocked off its pedestal by an upstart, and since the new entrants can design programs that overcome the deficiencies of the leaders, there is all the more reason for the front-runners to erect marketing hurdles for would-be competitors.

As Fred Gibbons of Software Publishing Corp. (SPC), Mountain View, Calif., publisher of the best-selling PFS:File and related programs, puts it, the barriers to entering the software business are "marketing, marketing, and marketing." He explains that in six months, "anyone can reverse-engineer anyone else's product," whether the product is PFS:File or 1-2-3. The way to protect a position in the marketplace, says Gibbons, is to advertise and promote so heavily that the competitor cannot gain a foothold.

SOFTWARE BUSINESS ECONOMIES

How publishers deal with the oversupply of software titles leads naturally to the second reason for the emphasis on marketing: the peculiar economics of the microcomputer software business. SPC spends a whopping 40% on all marketing, 15% just on advertising and promotion. These percentages are high, but by no means atypical. Communications Trends has found that business software companies spend an average of 35% on marketing—far more than they devote to either product development (15%) or manufacturing and fulfillment (15%). Fig. 3 shows these ratios in chart form.

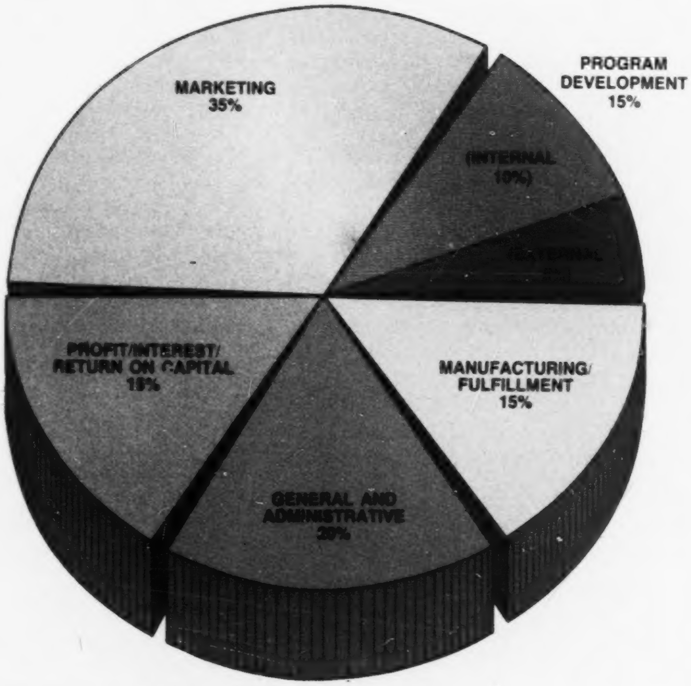
This pattern exists because business software publishing has very high fixed costs and relatively low variable costs. Once the first copy of a program is manufactured, the expense of producing additional copies is insignificant. Customers know that the manufacturing cost of a word processing or database program selling for $500 may be as little as $5 or $7. (This awareness is sometimes used to justify copying a program without compensating the producer.) What they don't know is that developing the program may have taken hundreds of thousands of dollars or years of unpaid toil by the programmer.

Nevertheless, the physical cost of making software is tiny compared to its price, which means that the gross margin on each copy sold is astonishingly high—95%, if one considers only manufacturing cost, 85% if one adds in royalties to outside authors and developers. Obviously the software publisher can afford to spend a bundle on making the sale, while retaining a very healthy portion of the proceeds.

And spend they do. Fig. 4 shows what four publicly owned micro software publishers spend on selling and administrative costs as a percentage of revenues—and what their pretax profit margins are. Lotus Development, which had such spectacular success with 1-2-3 last year, devoted more than 40% of its revenues to marketing and administrative costs, but earned an almost unbelievable 51.8% before taxes, in its first nine months of operation. BPI Systems, Austin, Texas, did almost as well, achieving a 46% pretax margin and keeping selling, general, and administrative costs to about 31%. (Its selling percentage has historically been

FIG. 1

HOW THE BUSINESS/PROFESSIONAL SOFTWARE SALES DOLLAR IS ALLOCATED



Source: Communications Trends Inc.

FIG. 4

SELLING AND ADMINISTRATIVE COSTS AND PRETAX PROFIT MARGINS FOR PUBLICLY OWNED MICROCOMPUTER SOFTWARE COMPANIES

COMPANY	PERIOD	REVENUES (in $ thousands)	SELLING, GENERAL AND ADMINISTRATIVE COSTS	PRETAX MARGIN
Ashton-Tate	6 mos. ended 7/31/83	$18,016	38.0%	29.0%
BPI Systems	12 mos. ended 3/31/83	6,067	30.8%	45.6%
Innovative Software	12 mos. ended 6/30/83	1,685	39.0%	17.3%
Lotus Dvlpmnt	12 mos. ended 12/30/83	29,103	40.0+*	51.8%

*Estimate based on interim figures

Source: Compiled by Communications Trends Inc. from company financial reports

low because of an emphasis on oem sales to manufacturers. Now that BPI is beginning to stress sales under its own name, marketing expense is on the upswing.)

The third reason for the overwhelming emphasis on marketing by business software firms lies in the structure of the industry, specifically the key role played by a handful of distributors and by several thousand retailers.

Just as the microcomputer software industry is only five or six years old (the industry can be dated from the release of VisiCalc in 1979), so the emergence of a computer/software retailing industry is also quite recent. Softsel, of Inglewood, Calif., the largest of the independent distributors, dates from only the end of 1980; Micro D, Fountain Valley, Calif., the second largest, was founded in late 1979. Among the computer and software store chains, Inacomp, Troy, Mich., was founded in 1976; ComputerCraft, Houston, Texas, in 1977; the Program Store, Vienna, Va., in 1979; Software City, Teaneck, N.J., in 1980.

As these companies have boosted their sales of software, and as the flood of new products has yet to crest, their market power compared to the software publishers has strengthened noticeably. To make retail sales the software publishers need retail shelf space; to get shelf space they must enlist the cooperation of the chains. As an example of the economic power of a couple of key accounts, in Lotus's first six months, 37% of its sales were to ComputerLand, another 28% were to Softsel. Indeed, Softsel had an exclusive on 1-2-3 until fall '83. As another example, in November '83 Ovation Technologies received the blessing of Tandy Corp., which adopted its integrated software for the new Tandy model 2000 computer. But in order to get its program into 1,100 Radio Shack outlets, Ovation had to agree that it wouldn't ship the IBM PC version of the software until the Tandy version was also ready.

By no means do the retailers and distributors hold all the cards. Microsoft has been reducing the number of distributors that carry its software from several dozen to about six. VisiCorp, MicroPro, Lotus, and other major software publishers have been beefing up their national sales forces to reach corporate customers directly, bypassing the retailer. In the case of Lotus, the dealer can earn a commission for assisting in such a sale, but the commission can only be applied against future purchases of Lotus software.

In general, however, it's only the very largest business software firms that enjoy such bargaining power. The small- to medium-sized publishers are forced to woo the distributors and the chains. To do so they must answer the blunt question posed to new

The allure of the software business is a combinaton of Hollywood and the early days of aviation.

companies by a key manager at Micro D, "What are your advertising plans?" It's not enough for the publisher to promise a budget of 10% of sales after the sales start rolling in; show us the color of your advertising money beforehand, say distributors, if you want any sales at all.

The need to work with manufacturers, distributors, and retailers is a continuing problem for software publishers. Yet it is also one of their greatest opportunities. Perhaps the most significant asset software companies enjoy is the assistance of many independent organizations in marketing their products: distributors, computer dealers, software retailers, mail order houses, bookstore chains like Walden and Dalton, and even mass merchants like Sears and Toys-R-Us. All these companies have a stake—and a growing one—in selling as much software as they possibly can.

Everyone has seen the Little Tramp in IBM's PC ads holding up a very high, somewhat shaky pile of software products. The message of this ad is clear: there is lots of software for the PC, and a computer that offers the best choice of software is the best computer.

Not only IBM, but Apple, Tandy, Texas Instruments, Hewlett-Packard, Epson, Kaypro, and Digital Equipment Corp., all trumpet software availability as a reason to buy hardware, and provide tens of millions of dollars of free advertising for software publishers. In the process, they reinforce industry participants' suspicions that what can really count is not the product itself, but the way that product is promoted.

EFFECTIVE MARKETING SUCCEEDS

Of course, effective marketing is required to succeed in the business software field. But the software executive at a multibillion dollar entertainment conglomerate, who told me in no uncertain terms that "it's a marketing-driven business," missed the point by a wide margin. A marketing-driven business is a mature industry like the detergent or auto industries, in which teams of market researchers are forever trying out new product names and new tv commercials on panels of "representative" consumers. It's far too early for software to be developed in this fashion.

The allure of the software business is a combination of Hollywood and the early days of aviation. Important attributes are instinct, creativity, flair—and a good grasp of technology. New products come from the minds of developers, not from customer questionnaires or focus groups. Indeed, until significant new programs are actually produced, no one can envision whether they are feasible or how they will work.

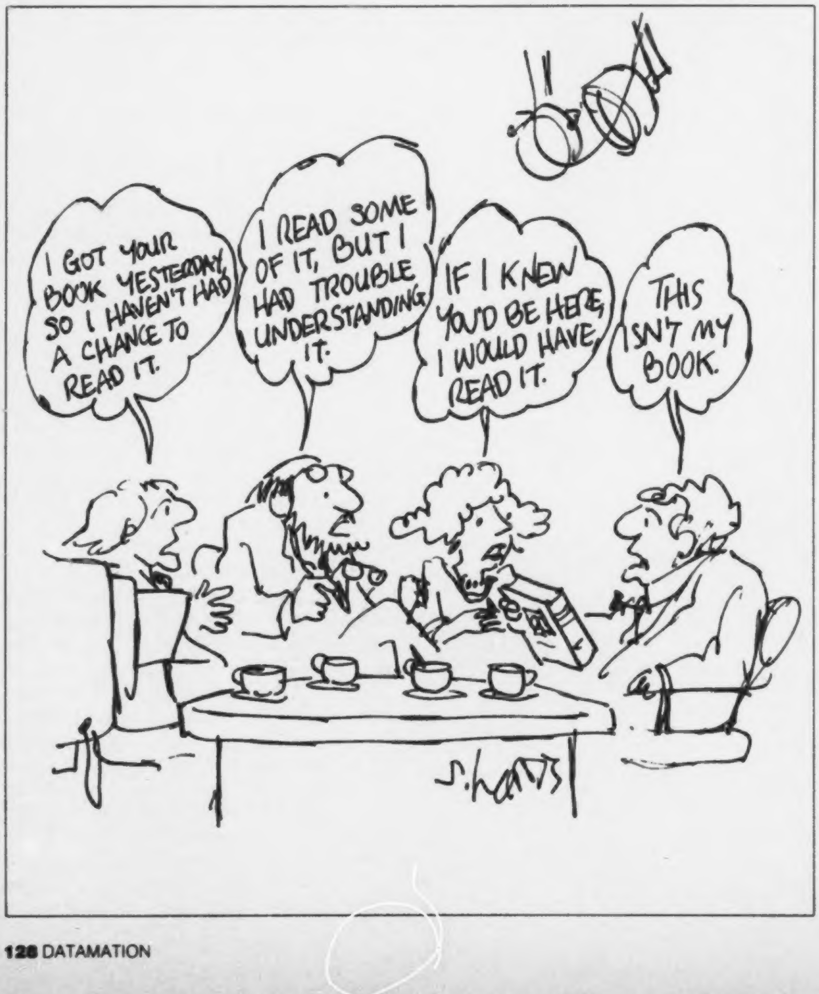
Even for people accustomed to the fast-lane pace of the computer industry, time has a different meaning for software companies. A year in this field brings changes that in other industries would astound. If we look all the way back to the end of 1982, for example, we see a time in which no one was using 1-2-3; the popular business word processing program, Multimate, had yet to be introduced; Microsoft Windows was completely unknown; and pc-to-mainframe links from MSA, McCormack & Dodge, and others were an idea, not a reality.

On the surface, however, the notable changes can appear to involve the selling of software, the appointment of new ad agencies, the drawing up of multimillion dollar promotion budgets, the constant drumbeat of media hype, and the ardent courting of distributors, dealers, press, and customers.

In such an atmosphere, one can understand how some software entrepreneurs have come to believe that they exist to advertise and promote. The truth is otherwise: they are in business to create programs that do a better job for users than competing products. In their rush to raise venture capital and to pour it directly into advertising, software entrepreneurs can easily overlook this elementary function. Indeed, they are being abetted in their error by the investors that stumble over themselves to squander money in this brand-new field.

The current leaders in micro software, companies like Microsoft, MicroPro, Lotus, Digital Research, and Ashton-Tate, have quite a head start in the race to define and lead this new industry. One should never underestimate the perils of an early success, though. It has brought grief to lots of companies over the years, and there is, unfortunately, no evidence that things will be any different in microcomputer software. ●

Efrem Sigel is president of Communications Trends Inc., Larchmont, N.Y., publishers of *Computer Publishing and Advertising Report Newsletter* and *Computer Publishers and Publications Directory*.


I GOT YOUR BOOK YESTERDAY, SO I HAVEN'T HAD A CHANCE TO READ IT.
I READ SOME OF IT, BUT I HAD TROUBLE UNDERSTANDING IT.
IF I KNEW YOU'D BE HERE, I WOULD HAVE READ IT.
THIS ISN'T MY BOOK.
S. Harris

CARTOON BY SIDNEY HARRIS

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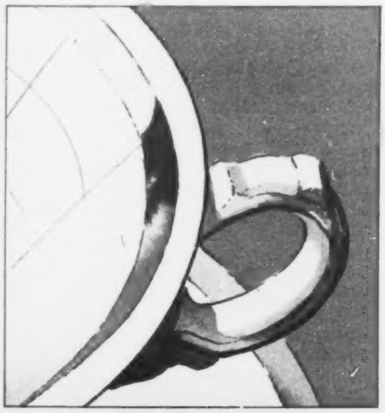

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COVER ILLUSTRATION BY ED SOYKA

With mainframe graphics, the corporate database makes sure your pictures are up-to-date.

MAINFRAME BUSINESS GRAPHICS

by Maxine D. Brown

Almost everything about the business graphics picture is glowing. A compound annual growth rate of between 40% and 65% is predicted for the rest of the decade. Vendors display an array of hardware—printers, plotters, film recorders, terminals—that offers choices of monochrome or color, high resolution or low, vector or raster displays, softcopy or hardcopy. Software comes standalone, integrated, application oriented, or as a subroutine library.

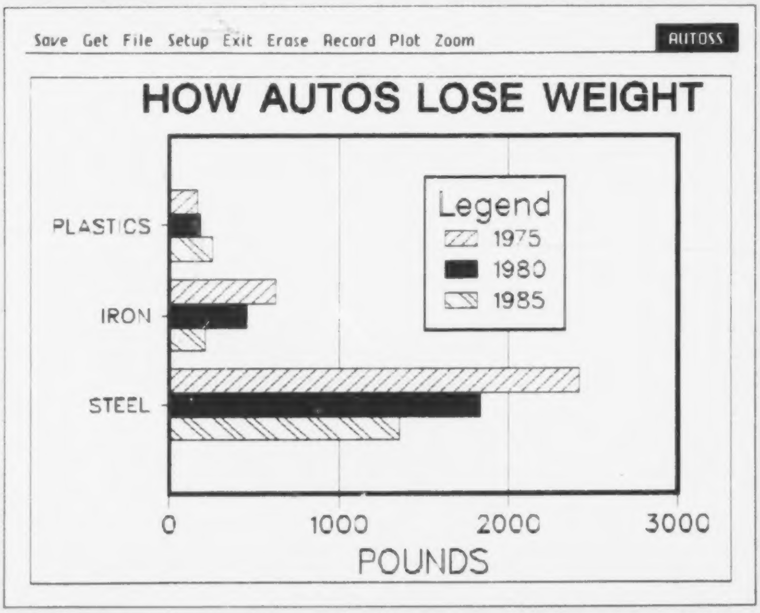
These business graphics have made presentations more convincing, publications clearer and more readable, and analysis and decision-making faster and more accurate. The power of visual communications to increase productivity has delighted the business market. But the variety of graphics schemes available has also led to confusion.

How can you make sure you've got your company's business graphics needs in focus?

If business graphics is a new application you're considering, you're probably wondering whether to start small and expand in-house capabilities as the demand grows, or to invest in a comprehensive software system that encourages new users and new application areas. Despite a somewhat higher initial cost, mainframe graphics produces a savings in operation, support, and labor, and allows for ease of expansion and growth. A comprehensive software system can easily be integrated with existing databases and application programs, can produce charts and diagrams of graphic art quality, interface with a variety of devices, and generate high volume in short time periods in a production environment. Let's explore some of these key

FIG. 1

MAINFRAME TO PC



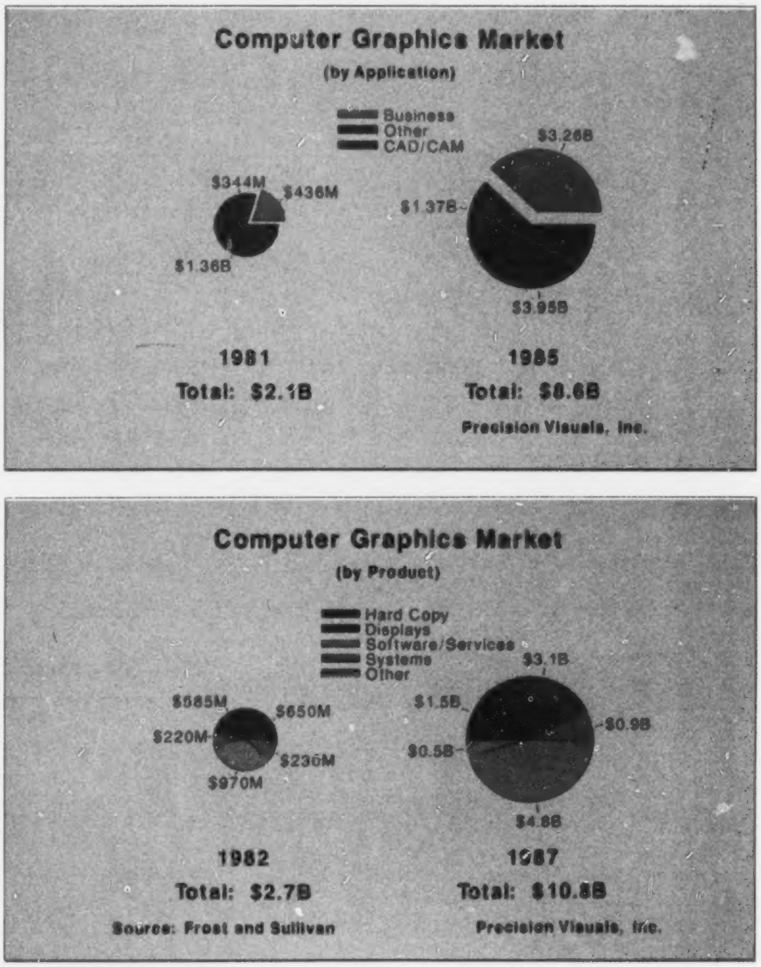
If you have existing graphics applications on your mainframe, you should be able to continue to use them on your personal computer. Mesa Graphics' Tekalike is a graphics terminal communication package that enables you to connect your personal computer to a mainframe. Tekalike supports the Tektronix 401X graphics protocol for graphics terminal input and output, making it compatible with virtually every mainframe graphics software package that supports the Tektronix 401X family. This chart was produced on a mainframe and then, using Tekalike, displayed on an Apple Lisa desktop computer. The output is a screen dump to a dot matrix printer.

Courtesy of Mesa Graphics

> **"Many users don't want the wealth of functionality available in the graphics package. They just want to get their pictures."**

FIG. 2

A MAINFRAME DESCRIBES THE MARKET



Device-independent output from Precision Visuals' Grafmaster package, a menu-based system that runs on DEC computers. Grafmaster's menu panels are formatted display screens that permit the user to create, modify, or delete a graph's pictorial elements; to specify the data to be displayed; and to display the picture on a selected output device.

Courtesy of Precision Visuals, Inc.

mainframe graphics features in more detail.

A friend once quipped, "What's a story without a plot?" He meant plot to be synonymous with graph, or chart, and his pun spelled out the need to integrate graphic illustrations with text.

The converse is also true: what's a plot without a story? Here, story refers to information, or data. A plot without data is absurd, but that is the situation that results when database management systems and graphics packages cannot communicate.

Jim George, president of Mesa Graphics, a Los Alamos-based firm specializing in computer graphics, comments, "A major problem facing business graphics is the automatic entry of data from applications (e.g., databases, spreadsheets) into graphics products. Also, when it's been accomplished once, it should be easily repeatable at periodic intervals."

To have a graph, you have to have data. You can either type data at the keyboard or, if you have access to huge databases managed and manipulated by a variety of DBMS's and data processing application programs, you should be able to integrate the data with the graphics. If the DBMS has hooks that allow you to embed programs, then graphics subroutine libraries can be used to construct specific chart types that can then be integrated into the application program. Standalone graphics packages, which have broad end-user appeal and encourage easy modifications to chart formats, now include features for reading DBMS or report files, so the output of one automatically becomes input to the other.

Besides allowing easy access to data, keeping the graphics with the data management routines is advantageous for reasons of security and control. The data always stay in one place.

GRAPHIC ART QUALITY

Until four years ago, computer graphics was to traditionally generated graphics as computerese is to English: it wasn't very good. But no one seemed to mind. Engineers and scientists were the major users of computer graphics, and they were more concerned with the efficient visual representation of their data than with aesthetic appearance.

But four years ago IBM announced a color graphics terminal, and graphics suddenly became respectable. During the following couple of years, the new business user community that bought the IBM machines began to demand better quality graphics. What was good enough for an engineer or a scientist was not good enough for the chairman of the board. Complaints came from corporate art departments where graphics designers found themselves redrawing computer-generated charts and graphs.

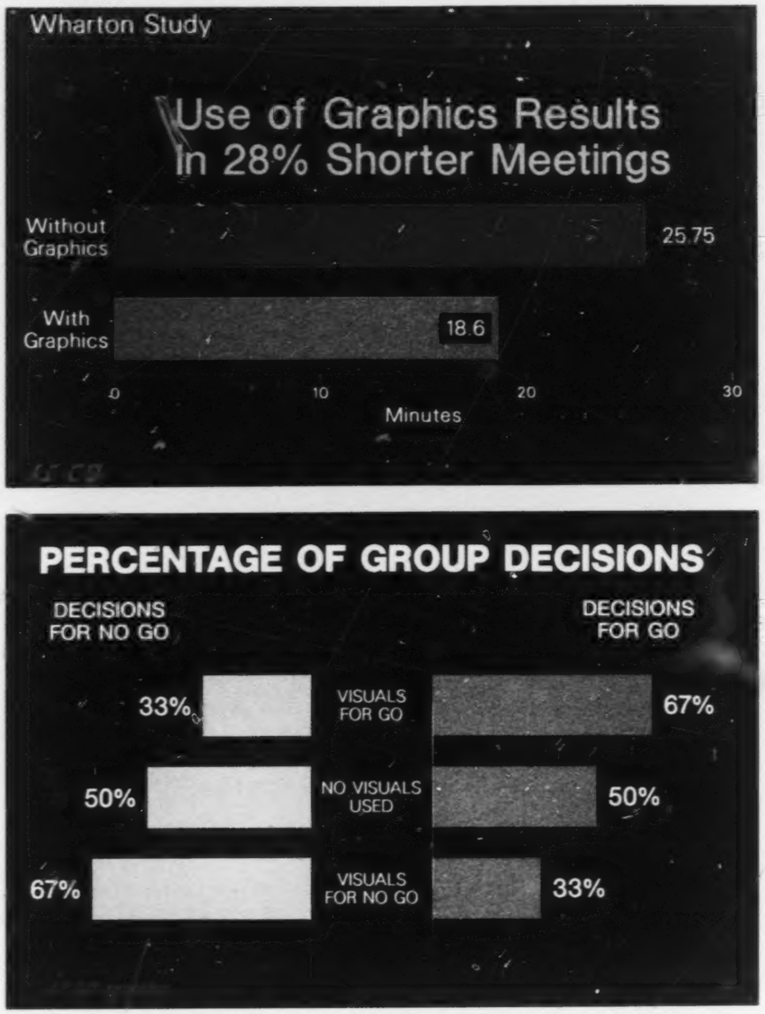
"Quality graphics in the business environment is crucial," observes Jim George. "The aim of business support graphics is to understand the data and influence decisions. Influencing decisions requires communicating the analysis in graphic form to peers and bosses. As in most personal interactions, an unkempt appearance, personally or with graphics, is hard to overcome."

Today's variety of equipment, cost/performance trade-offs, and applications needs have created three levels of quality: presentation, peer, and personal.

In presentation graphics, the aesthetics are as important as the information being displayed. Illustrations are usually prepared for upper management, the board of directors, or stockholders. Image quality affects the way the information is received and the way the speaker is perceived by the audience. The more effort put into the preparation of presentation materials, the more persuasive

FIG. 3

DO GRAPHICS WORK?



In a study of the effectiveness of business meetings, conducted in early 1982 by the Wharton Applied Research Center of the Wharton School, University of Pennsylvania, under a grant from the Audio Visual Divison of 3M, the use of visual aids (specifically the overhead projector) was shown to significantly influence the actual decisions reached, how the presenter of information was perceived by meeting participants, and whether or not the meeting leader could quickly reach a consensus. In the test situation, those using visual aids won their points 67% of the time, were perceived as more professional by group members, and achieved consensus in a 28% shorter meeting time.

Courtesy of ISSCO

the presentation.

Peer graphics is charts and diagrams one shows to colleagues or subordinates. The output quality is of some consideration, but more important is the clear visual representation of information.

Personal, or throwaway, graphics are those generated for personal use in analysis and decision-making. Plots are quick and dirty, and a soft screen copy is often all that's generated. The emphasis is on data representation, not quality.

Flexible software permits a variety of different charting options. For example, large companies establish design standards and corporate grids, color, and logos that they want to be able to recreate using a graphics software package. A flexible system also permits a variety of chart types, trial and error designs, random placements, multiple charts per page, and batch or interactive execution. Designers and end users can create charts and graphs to their specifications. End users can produce the best charts possible for maximum communication.

The term user friendly (AKA ease of use) is overused and misused. User-friendly software needs a simple test: try it! See if you like it! Have it demonstrated by salespeople; have your secretaries, graphic artists, technicians, and staff play with it; get testimonials from other customers; talk to friends in related industries and see what they use.

"I see two classes of business graphics users," comments Jim Warner, president of Precision Visuals, Boulder, Colo. "The first group is the layout builders charged with preparing general or specific graph layouts for an organization. The next class of users are analysts, managers, scientists, or clerical people who want to use layouts, plug in their data, and get a picture. They don't want the wealth of functionality available in the graphics package. They just want to get their pictures," he says.

"Stencil designers have traditionally worked with pencil and paper to design the layout of a page, the placement of a graph, or the position of titles and labels," continues Warner. "They must have the same flexibility when using a computer, and it's the software manufacturer's responsibility to give the user control over the computer, instead of letting it control him. Many people want to add simple embellishments to their graphs, such as shrinking the drawing area or moving the text 'a little to the left.' Using an electronic pencil, which comes in the guise of a mouse, joystick, or tablet, the designer can simply define new locations by pointing."

Various ways that end users specify graph choices include menus, from which choices are made; tables, where users enter values in formatted fields; prompting systems, which repeatedly ask questions and list all available options; or command-driven systems, which require that you know the command syntax. Chart books are also popular; end users either receive predefined graph formats from the software supplier or customize their own.

One other aspect of user friendliness is documentation. A user manual is the only tangible aspect of software you can evaluate without access to the system. Is it clear, concise, and comprehensive? Is it interesting, illustrated, and well organized?

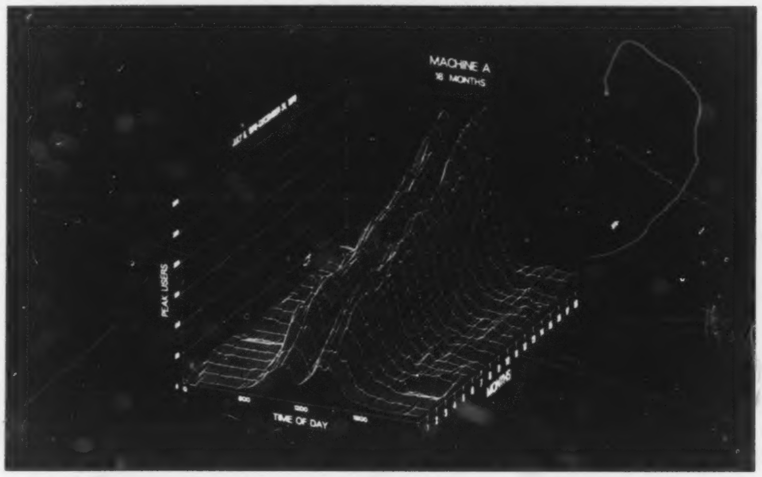
User friendliness can have its unfriendly side. More and more unsophisticated users can take advantage of in-house graphics capabilities once user-friendly ones become available. Graphics software, per se, doesn't saturate a system, but increased usage might. Also, the more users, the more questions that arise on software capabilities and system operation. Before long, an in-house support person becomes necessary to supervise equipment acquisitions, integrations, and

In large corporations, the host computer has become the repository for data and graphics.

software usage. You might find yourself shopping for another computer to support all this increased activity.

FIG. 4

A PICTURE OF POPULARITY AND LUNCH



This 3-D graph effectively displays the number of people accessing machine A at different times of the day over an 18-month period. We see heavy user loads in midmorning and midafternoon. The surface depression at noon portrays what happens at lunchtime. The surface mounds increase over time, reflecting an increase in the number of users.

Courtesy of ISSCO

DEVICE INDEPENDENCE The ability to interface to any graphics device is called device independence. It is a distinguishing characteristic of mainframe graphics. Mainframes can interface to $2,000 personal computers or $350,000 film recorders, to desktop pen plotters or six-foot flatbed plotters, to dot-matrix printers or $500,000 photocomposition laser machines.

Device independence not only means the software can talk to a variety of peripherals, it also means the software can talk to any make or model of graphics equipment. Graphics packages can be interfaced to current, in-house devices, to new acquisitions, and to next year's technology, as well.

Graphics applications can grow as your needs and applications increase. The same software package can plot on low-cost peripherals and high-performance devices. If user needs switch from presentation slides to typeset publication material, the graphics are adaptable and system modifications are transparent. Device independence also describes software that supports all graphics hardware devices.

The next generation of software that came along adapted to the peculiarities of output devices. Anders Vinberg, vice president of research at ISSCO, San Diego, coined the phrase "device intelligent" to describe software that takes advantage of local device performance capabilities, such as polygon fill, hardware characters, segmentation, and variable drawing speeds. The software utilizes these capabilities to perform tasks whenever possible. Device-intelligent software reduces demand on the resources of the host computer and communication links, which reduces computer time and expense.

Device intelligence resulted in faster drawing speeds, but wasn't enough to achieve graphic design quality. "Layout intelligence," ISSCO's current generation software, modifies the layout of the graph to fit the characteristics of the output medium. The software understands the application and helps the end user make the graph that's needed.

For example, a chart to be published in a book may be oriented vertically, contain lots of text, and require black-and-white shade patterns to distinguish the various datasets plotted. A similar chart, to appear on a slide, needs to be oriented horizontally, contain minimal text, and have solid colored areas in lieu of shade patterns for distinguishing data. Layout-intelligent software adapts the graph to the situation; it worries about page orientation, annotation style and size, and dataset identification.

Mainframe graphics software should not only be able to talk to a variety of devices, but it should also be able to run on a variety of host computers. Whole organizations are then free to standardize on one software package. Systems support knowledge and user programs are portable throughout the company.

These software advances mean that, today, graphics is becoming commonplace. It probably won't be long before we run production graphs every weekend for Monday morning distribution.

Advertisements no longer feature people looking with smug satisfaction at a plot they've just produced. As Anders Vinberg observes, "Graphics is no longer the front line of technology. It's production work. People are beginning to think in terms of throwaway graphics."

"Mainframes have the data, the horsepower for high volume and fast turnaround, and the interfaces to high-performance film recorders and laser printers," Vinberg continues. "Production graphics is a new phenomenon. Only recently have manufacturers developed graphics interfaces for high-speed, on-demand production laser printers."

Vinberg asserts that the graphics community has to pay attention to what's happening in the computer industry, and adapt accordingly. "Graphics is only as valuable as the data it portrays. The end user is only interested in getting his information across."

ISSCO views its layout intelligence feature as the cornerstone of production graphics. End users can produce report illustrations and presentation slides by changing two commands in the company's Tell-a-Graph package: one command changes the output device specification, and the other enables automatic layout changes. It's impractical to reformat charts every time the device changes. Mainframe power and intelligence make it possible to do things automatically.

SUPPORT, MAINTAIN, TRAIN As a rule, mainframe software suppliers pay strict attention to the quality of their customer relations. There is concern for providing adequate product installation, support, maintenance, and on-site training. There is also a feeling of responsibility on the part of the software supplier to keep abreast of the latest technological developments, in both hardware and software, and to keep customers informed of new device interfaces and up-to-date product enhancements. After all, current customers account for a large percentage of future sales, either by repeat purchases or by referrals.

The role of the personal computer in corporate graphics is limited. There are many applications where standalone personal computers are extremely helpful. "The personal computer is just another tool, as is the handheld calculator," observes Jim George. "The personal computer's role is that of a talented specialist. It can help you with reports, papers, or memos by providing word processing; it can provide help with accounting; it can help with financial planning through the use of spreadsheets; it can help with project planning; it can create graphics to illustrate ideas."

Buyers, however, should not confuse the low cost and varied functions of personal computers with corporate application needs. If you need to support a number of end users, provide quality results, and access extensive data files, mainframes may actually be cheaper. Personal computers allow one user at a time; mainframes more. Personal computers are more appropriate for one-time jobs; mainframes are suited for production work. It's also worth noting that mainframe costs are continually dropping while memory and speed are increasing, making them more economical and more practical than ever.

In large corporations, the host computer has become the repository for data and graphics. The personal computer functions as a front-end terminal and receives tabular data from the mainframe for graphic display. Results can be plotted on local devices or queued for production on high-performance peripherals.

George's company, Mesa Graphics, is involved in the development of graphic communication packages that enable mainframes and personal computers to communicate. The Tekalike package makes personal computers Tektronix-compatible. Since most mainframe software packages interface to Tektronix devices, the Tekalike interface encourages graphics communication between the two systems.

Both ISSCO and Precision Visuals have demonstrated the capability of downloading mainframe graphics to small computer systems. This migration will continue as next-generation micros using more powerful microprocessors reach the market. Powerful micros are a prerequisite for ISSCO. "We will not compromise on quality or intelligence," states Vinberg, "because we know our customers want it." Warner adds, "It's obvious that the distinction among mainframe, mini, and microcomputers is becoming blurred. A 'personal mainframe' is imminent. As such, the concept of 'mainframe-based business graphics packages' will soon collapse to 'business graphics packages.' "

Computer graphics is quickly becoming an integral part of office automation technology. "Within the next 10 years," observes George, "end-user computer equipment will not be offered without graphics. Applications will assume graphics, and graphics will take its place among the existing tools of business. Business graphics will disappear as a separate entity; it will be an option in every application, business or otherwise." ✱

Maxine D. Brown is an independent consultant, specializing in technical communications for the computer graphics industry. She is secretary of SIGGRAPH, a national computer graphics professional society.

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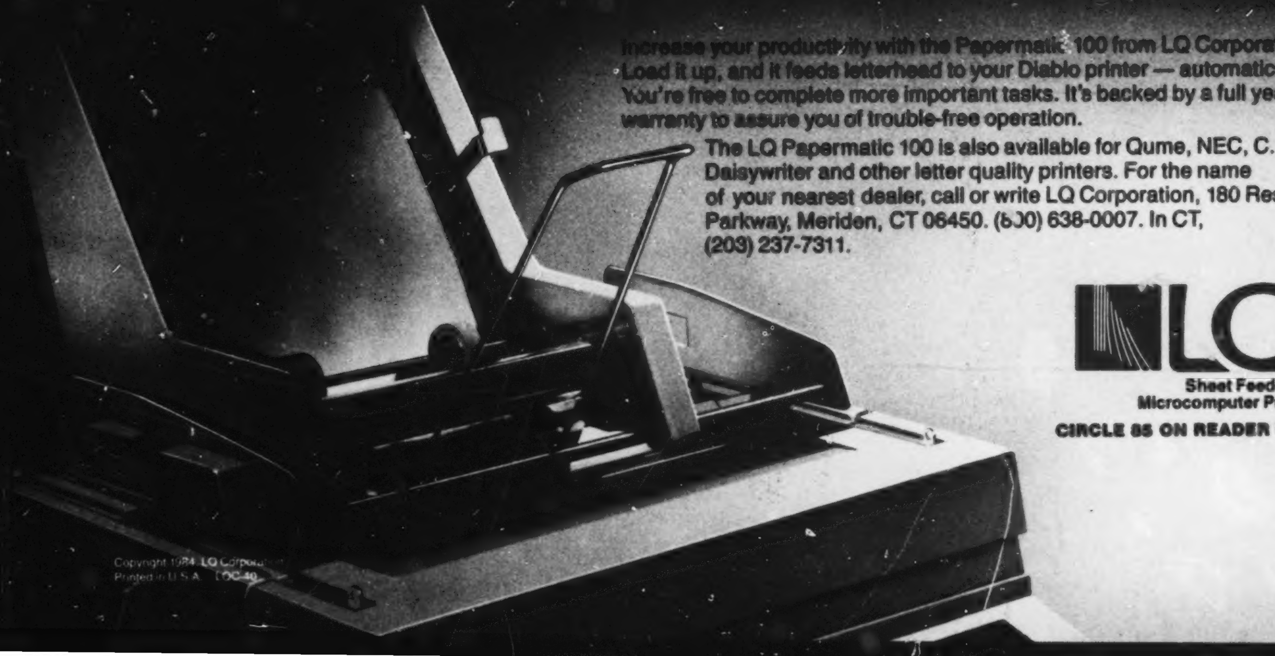

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Demand continues to detonate for one of the dp industry's most explosive fields.

EUROPEAN MICRO MOVES

by Paul Tate

It is 11 years now since the world's first microcomputer—the Micral from French company R2E—was launched onto an unsuspecting and unresponsive European market. Much has changed since then. European users have in fact bought almost as many business microcomputers in the 17 months since IBM debuted its Personal Computer in Europe as they have in the previous 9½ years.

At the beginning of this year, 1.1 million business micros were installed in Europe, according to the latest Telematica European market survey compiled by Logica in the U.K. That represented an increase of 52% over 1983. Such explosive growth is expected to continue, with the number of business micros predicted to pass the 1.6 million mark before the end of 1984, reaching 6.3 million by 1990.

The fact that prices in Europe are generally 10% higher than in the U.S. has not deterred would-be users. Indeed, last year some $1.7 million worth of micros were shipped in Europe. Not only are European users buying more, they are also becoming more discriminating in what they buy, and from whom. "Customers are less forgiving now," notes David Broad, chairman of the British Microcomputer Manufacturers Group. They demand more rounded products and better service."

Keith Teare, manager of the Greater Manchester Microsystems Center, which gives advice to novice U.K. users, adds: "The people who see us are looking for permanence. They want a system that will do what the vendor says it will do and a supplier that will be around in six months' time."

So far micros are being used extensively by smaller firms in Europe. The machine population in larger corporations, however, is still patchy. This is partly because managers in some large European companies are more reluctant to buy their own systems from petty cash. It's also due to the fact that many large companies want to be able to plan the introduction of micros into their organizations before signing bulk orders.

In some cases, large companies have tried to ease this introductory process by deliberately encouraging staffers to learn about microcomputers. Other incentive schemes have also been tried. The large Norwegian insurance group Vesta-Hygea, for example, will pick up part of the cost if an employee buys a home computer.

It is not that European companies have necessarily been slow to take the micro plunge. It's more that they are looking at the micro more cautiously, considering it one element in their overall data processing strategy. Louis Nardon, dp manager at French oil, company Elf Aquitaine, is one exponent of this approach. "The micro is something that will be used across the company, but it must be used well, otherwise it is not economical."

Nardon has formulated a number of basic rules for the way micros are introduced into Elf Aquitaine. "First, in a large company where there are already numerous dp systems and large databases, micros must be able to access the major systems. Communications is of the essence. Second, executives do not need to become computer scientists—and especially not programmers. We only supply them with equipment if suitable software products are already available."

Nardon's comments underscore two main trends in the European micro market for large organizations—communications facilities to allow that all-important micro-to-mainframe link and centralized purchasing of and control over the micro.

While these trends are apparent elsewhere in the world, in Europe they are often the starting point for large companies that want to avoid the spread of incompatible micros. At the end of last year, over 70% of large European companies had already formalized central evaluation and selection procedures for micros, Logica reports. About 40% of the firms surveyed had also compiled lists of approved micros—lists that would help overcome the incompatibility problem.

This compatibility concern is especially strong in Germany, where users take the introduction of micros even more seriously. In fact, the number of German companies with lists of approved machines was as high as 50%. That doesn't mean that everybody abides by the rules. Some user departments have indeed gone their own way with micros. One constant problem for Pierre Sarremejean, OA manager of the French building and

FIG. 1

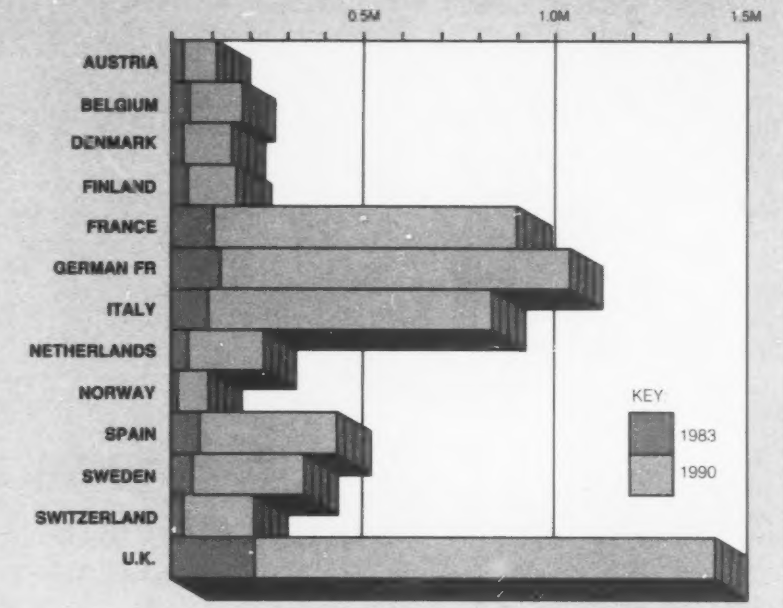
EUROPEAN BUSINESS MICRO SHIPMENTS*

SHIPMENTS IN UNITS	1984	1985	1986	1987	1988	1989
Benelux	40,162	52,363	66,913	82,933	100,168	118,568
France	79,013	103,205	132,535	165,148	200,566	238,747
Italy	74,285	96,364	127,262	161,399	198,055	237,081
Scandinavia	64,999	84,584	107,471	132,350	158,811	186,734
Spain	37,749	48,617	63,046	78,386	94,238	110,525
U.K.	136,012	176,162	217,237	258,770	302,409	347,938
W. Germany	93,878	122,514	154,987	191,484	230,608	272,081
Other	42,547	55,560	71,013	88,044	105,595	123,540
TOTAL	568,645	739,369	940,464	1,158,514	1,390,450	1,635,214
VALUE OF SHIPMENTS (IN $MILLION)						
TOTAL	2,564	3,491	4,535	5,414	6,673	8,179

*Basic system price: $1,000 TO $15,000
Source: Logica Telematica Survey

FIG. 2

EUROPEAN INSTALLED BASE OF BUSINESS MICROS



SOURCE LOGICA TELEMATICA SURVEY

industrial giant Saint-Gobain, is "pirate users who come knocking on the dp department's door when they have problems."

The penalties for such independence can be severe, especially in companies with formalized corporate cultures. "A certain number of micros are not connected to our main systems and not approved by us," explains Elf Aquitaine's Nardon. "These machines exist where departments have made their own choice with their own money. When they come to us with their problems, we simply refuse to help them and let them stew in their own juice." It's clear from such comments that some European dp shops are simply not prepared to be user friendly to the in-house micro mavericks.

On the communications side, European users are currently testing the water. And they're at that tentative stage because of their general lack of experience in setting up networked applications for micros. The lack of effective software for linking micros to larger systems also hasn't helped.

Nevertheless, Logica found that around 19% of the micros installed in Europe last year did indeed have communications connections. Breaking this figure down further, Logica reported that 15% of these systems had some level of communications with mainframes or minicomputers, while the remaining 4% were hooked to other micros. Logica expects that by 1990, 75% of the business micros installed will have communications capacity.

Blair Mascall, a senior consultant with the informatics section of the Economist Intelligence Unit (EIU) in the U.K., points out that the organizational implications of hooking micros to mainframes can be desirable for large companies. "When micros were first sold in Europe, buying them was in many cases an individual decision. Users were able to break with the data processing department. The use of a micro-to-mainframe link reestablishes the relationship since that is a corporate decision." The micro-mainframe connection, therefore, represents a new method for Europe's cautious dp professionals to reassert their corporate-wide influence over all things technological.

Right now European users are just beginning to make those communications connections. Howard Sach is one dp manager who has begun operating a micro-to-mainframe link. Sach, who works for the Norwegian branch of the packaging firm Elopak, has hooked up two IBM PCs to his company's 4300 system. "We have a requirement for local processing—word processing, spreadsheets, and graphics—and we don't want managers with both a personal computer and a terminal on their desks, rekeying information into the PCs when it is already available on the mainframe. With the two PCs hooked to the 4300, we expect to get some real experience with such a link. It is expensive, particularly since we have a lot of software on the system that we are not using yet."

As users in large as well as small firms become more proficient in using micros, access to outside networks becomes increasingly tempting. The growing end-user demand for access to external databases, videotex services, and office networks such as teletex will make the need for communications facilities even more acute.

European suppliers and software houses are already picking up on this trend. A number of German companies, including Telematic and Mupid, are developing software to link pcs into the German Bildshirmtext videotex system. Meanwhile, in France, Goupil offers software to connect its pc with the French videotex service. In the U.K., there is the Micronet system that provides pc links to Prestel; Victor distributor ACT in the U.K. also has the Micromail package that connects pcs to British Telecom's Gold electronic mail service.

The need for more communications connections, coupled with the compatibility issue, helps explain why many large European users waited for IBM to enter the market before boarding the micro bandwagon. The IBM PC, in fact, stimulated the development of micro-to-mainframe software.

IBM, which is expected to be a leading supplier in the European micro market, hasn't made it to the top yet. Seventeen months after the European launch of the IBM PC, users still have not flocked to buy the machine, which is scoring big sales in the States. European sales in 1983 for the IBM PC range from an estimated 25,000 to 50,000 machines—a relatively poor showing for the world's number one dp company.

Despite media campaigns across Europe, IBM was forced to make savage cuts of up to 25% on its micro line in March. IBM U.K., for instance, dropped its basic PC price by 20%—which makes the machine 13% cheaper than in the U.S. These micro moves were designed to boost Big Blue's sales.

There are a number of factors behind IBM's slow start. For one thing, the company was a latecomer to a booming European microcomputer market that it indirectly helped to foster by hoisting its PC colors in the U.S. in 1981. During the period between introductions, IBM Europe was forced to go without a product while many business users—around 740,000 to be more exact—bought what they could get. The field was therefore left open to other American micro vendors and the increasing demand aided the growth of many European vendors and distributors.

NATIONAL MARKET DIVERSITY

Local European companies were also helped by the diversity of Europe's 17 national markets, which often require specially tailored approaches to marketing, software, and distribution. This gives start up companies a jump on larger firms. According to Logica, there are currently around 340 microcomputer suppliers in Europe, 119 of which are well established enough to have outlets in at least two European countries.

"Local language software will help increase the number of microcomputer users."

In the face of so much competition, IBM so far has managed to scrape together only 5% of the European business computer market. Big Blue's shipments, however, probably now account for around 10% of the total, Logica estimates. Meanwhile, Apple and Commodore are clinging to 20% of the market, while other suppliers are vying for the rest. U.S. vendors currently dominate 70% of the European market, except in Italy, where Olivetti is prominent. This leaves around 28% of the market for Europeans and 2% for the Japanese.

In the U.K., Europe's strongest microcomputer market, IBM is trying to catch up with its main competitor, ACT, an aggressive Victor distributor that also sells its own Apricot portable machine. Some estimates for last year put IBM sales at 800 units and ACT sales at 1,200. Considering Victor's financial troubles in the U.S. and IBM's growing European business, ACT's success is likely to be short-lived. Indeed, other estimates put IBM and ACT neck and neck in the British market.

Success in the U.K. market is no mean feat. Since the first computer store opened its doors in 1977, Britons have shelled out more for microcomputers than people in any other European country. Around 304,000 machines are now being used in businesses in the U.K., while a staggering 2 million homes boast cheaper domestic models.

EIU consultant Mascall explains that the U.K's responsiveness to micros "can simply be put down to the fact that Britain has more educated customers. The government has had a lot to do with increasing this awareness merely by standing up and saying that these machines are worthwhile and not just a fast American import."

The education of people outside the company environment has played an important role here. Some of that education begins in the schools; almost every U.K. school has a micro. The BBC, which has put together tv programs on micros, has also sponsored the development of its own micro for viewers. Of course the widespread success of Sinclair's range of low-cost home computers has done much to spark interest in the professional use of micros. Sinclair has now decided to tap a little of this interest himself and describes the new QL machine from Sinclair Research as a semi-professional system.

The result of this increased awareness can be seen at the business level, where U.K. users are becoming more demanding. This more aggressive attitude toward buying systems tends to favor manufacturers that have the resources and know-how to support their products in the long term. Teare of the Manchester center says that he is surprised by the number of would-be users who automatically reject the idea of buying systems from smaller companies. "We can recommend systems and find people will query them because they have heard of the problems of Victor and Apple. So they insist on IBM." That naturally augurs well for IBM PC sales in the U.K.

West Germany is also likely to produce big sales for Big Blue. The number of business microcomputers in Germany is expected to reach around 200,000 by the end of this year, according to Diebold Germany. It is a safe bet to say that IBM will have a significant proportion of that business.

The German buyer is traditionally more cautious than most other Europeans when considering something new. "Users want to know all about the machine, how it is going to help, and about the company behind it before agreeing to part with money," explains one American marketing manager. Also, many of the pcs in Germany will be ordered in quantities by companies hoping to plug the micro in as a multifunction workstation. So far, the only order of any size has come from industrial gas firm Agagas of Hamburg.

The IBM micro approach, which is serious and aimed at the networking niche, should go over big in Germany. The same networking tack is also being taken by two of Germany's main dp suppliers—Siemens and Nixdorf. Siemens offers its 16-bit pc mainly to its mainframe users, while Nixdorf plans to sell its machines as multifunction workstations that can be hooked onto its computer systems.

Germany is far from being a complete IBM devotee, however. The U.S. giant as a matter of fact has already suffered a major distribution setback in Deutschland. IBM had initially set up a deal with the Metro Group, a German wholesale chain headed by a former IBM Germany manager. Rumors suggest, however, that the Metro Group sold less than 1,000 units last year for IBM. The company then set up a PC arm, IBM Produktuertrieb GmbH, which started to attract dealers. Nevertheless, the 1983 PC sales targets had to be chopped from 16,000 to 10,000, and some sources say IBM Germany missed this.

GERMANS GO AFTER BIG BLUE

In addition to the distribution problems, IBM has also had to face stiff competition from such firms as Olympia, Triumph Adler, Computer Technic Muller (CTM), and Taylorix. One of the more promising German contenders had been David Computer, which failed last year because of a chip shortage. A buyer was soon on hand, however—Sweden's Ericsson snapped up the company, hoping to use it to obtain a marketing foothold in Germany.

In its home market, Ericsson is trying to make headway against both local and U.S. rivals. One strong local competitor is Luxor, better known for its tvs. The Swedish company was brought up last year by Finnish conglomerate and dp company Nokia. Also in the running in Scandinavia are Sweden's Gylling, which sells a Taiwanese Apple copy called Microprocessor II; Norway's Mycron, with an 8086-based machine; Denmark's Christian Rovsing; and Nor Sales, which made a fortune selling Osbornes in Norway after that company collapsed.

Depite all this local activity, Scandinavian buyers are still more attracted to U.S. micros. More so than the French, who bought around 25% of their micros last year from French companies such as SMT-Goupil and Bull-Micral, which now includes the old R2E company, Léanord, and Logabax.

Gordon Curran of Paris-based researchers Intelligent Electronics believes this 25% French share could simply be attributed to user chauvinism, since the products were not technically impressive. SMT-Goupil chairman Claude Perdrillat disagrees. "It is not necessarily an advantage to be French," he argues, "except when it comes to selling to the administration. There is still a lot of competition in the general business market."

That may be true on the hardware side, but when it comes to software the French users have a strong preference for local application systems. While this tendency may appear to be more marked in France, it also holds true for most European users.

U.S. operating systems travel well across the Atlantic, but application software, as Lotus found when it brought its 1-2-3 package to the European market, has to be tailored to suit national needs. European users feel that this is only reasonable because of the substantial fees they pay for some U.S. packages.

Over the past year there has been a significant increase in the number of microcomputer software houses setting up shop across the Continent. These companies are creating their own application products, as well as adapting U.S. packages for the local markets.

The growth of a local software industry in Europe is singled out by Logica researcher Steve Timms as one of the main factors determining the continued increase in microcomputer usage in the European business sector. "Local language software," he notes, "is going to be very significant in Europe. It is critical for the real growth of the market and will help substantially to increase the number of microcomputer users." ✽

Also contributing to this article were James Etheridge, Peter Hidas, John Lamb, and Peter Wurr.

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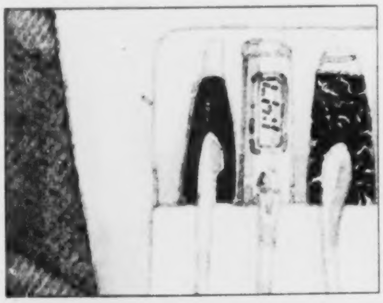

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The big machines continue to grow as they are called upon to service data-hungry personal computers.

SURVEYING THE MAINFRAME LANDSCAPE

by John W. Verity

The personal computer, particularly as sold by IBM, continues to gain importance in the mainframe data processing world, accounting for a growing amount of revenues for manufacturers and forming the basis for many user-oriented applications. While IBM enjoys increasing acceptance of its PC as a de facto standard in the corporate sector, its mainframe competitors are finding mixed success in trying to penetrate the all-important, high-growth pc/office systems markets.

According to the 1984/85 computer market survey, researched for the 12th year by Cowen & Co. in conjunction with DATAMATION, the IBM PC will capture three quarters of respondents' planned personal computer purchases during 1984, up from a commanding three fifths of last year's unit purchases. Apple's share of respondent unit purchases will shrink to 6.7% from last year's 18.5%, according to the survey results.

The survey comprises responses from 4,993 U.S. and Canadian user sites received prior to Feb. 29, 1984. Increased observation of telecommunications, personal computing, and software trends were made in this year's survey. In addition to a penetrating look at IBM mainframe sites, the survey detailed spending and procurement trends at Sperry, Burroughs, NCR, and Honeywell shops.

Some major conclusions can be drawn from this year's survey results:

- IBM has found great success with its System/36 midrange machine, the Personal Computer, and increasingly so with its new 4361 and 4381 systems.
- Plug-compatible manufacturers (pcms), both in the cpu and peripherals markets, offer little threat to IBM, despite gains they have made in the 3380-class disk arena.
- In general, large-scale system users are showing the biggest appetite for additional computing capacity, a good portion of which

FIG. 1

NON-IBM USERS NEED MORE INDUSTRY APPLICATIONS SOFTWARE

Query: Which category of service needs the most attention by your vendor?

	MOST FREQUENTLY CITED CATEGORY			
Industry served	**Honeywell**	**Sperry**	**Burroughs**	**NCR**
Manufacturing	Applic. software	Applic. software	Applic. software	Applic. software
Wholesale/Retail	Applic. software	Applic. software	Maintenance	Applic. software
Financial Instit.	Applic. software	Applic. software	Applic. software	Applic. software
Service Bureaus	Sales personnel	Applic. software	Maintenance	Systems engineering support
Education	Applic. software	Applic. software	Applic. software	Applic. software
State/Local Govt.	Applic. software	Applic. software	Applic. software	Applic. software
Federal Govt.	Applic. software	Operating systems software	Systems engineering support	No mention

is being fueled by demands placed on mainframes by the growing pc population.

- Applications software is generally the weakest point for non-IBM mainframe suppliers, according to users.
- IBM is garnering an increasing share of distributed processing and office systems installations, even at sites that are using non-IBM mainframes.
- High-end Sperry users are apparently convinced the manufacturer will finally be able to deliver its long-promised but delayed 1100/90 mainframe.
- A warm reception for NCR's 9000 series of machines is expected, but demand for the Convergent Technologies-built NCR Worksaver may be on the wane.
- Pent-up capacity demands among Burroughs users look strong, boding well for the company's order rates into 1985.

Among IBM mainframe users, the industry leader is enjoying continued strong demand for its products, particularly among large-scale users who are nearing capacity on their 308X mainframes, according to the survey. While the results of the survey were tabulated before IBM's March mid-life kicker to the 308X series, the 308XX machines, the survey shows a strong outlook for the 3084 segment. Following last September's introduction of the 4361 and 4381 cpus, respondent demand appears strong for those machines. Indeed, the 4381 is perceived as siphoning away orders from users who would previously have ordered 3083 computers.

Despite the aging of the 308X product life cycle—a follow-on line of mainframes code named Sierra or Trout is expected to be unveiled by early next year— the vast majority of 308X machines are being booked as purchases. In terms of dollar value of 308X installations planned for the following 24 months, users said they would purchase 44%, lease 8% from IBM Credit Corp., lease 33% from third-party lessors, and lease 11% from IBM on a long-term basis. That leaves only 2% renting machines from IBM. IBM Credit Corp's portion of that overall 308X activity is up from 3% in last year's survey, but still substantially below that of third parties.

As for 4300s, on a similar dollar value, 24-month basis, 45% of the machines will be purchased, 9% leased from IBM Credit, 31% leased from third parties, 10% leased from IBM for two years, and 2% rented from IBM. (About 3% of the 4300 machines will be purchased on the used computer market.)

Last year saw a substantial shift from lease to purchase, particularly in the IBM installed peripherals arena, where, for instance, only 17% of survey sites were renting or leasing disk drives directly from IBM, compared to the previous year's comparable figure of 47%. Similar shifts were seen in add-on memory—to 12% from 31% leasing or renting from the parent corporation—and in terminals, where last year's figure of 53% dropped to only 17%.

Disk drives and terminals were seen as showing the strongest procurement activity among respondents, with almost 40% of respondents planning to acquire products this year in each category. Comparable figures for tape drive and add-on memory hovered in the 12% range.

The presence of plug-compatible manufacturers' gear at IBM installations is seen as fading, particularly in the add-on memory area where only 15% of medium to large sites indicated pcm products installed. The comparable 1981 survey showed add-on memory at 42% of the survey sites.

In the disk business, IBM is clearly dominating all activity, despite an uptick in pcm shipments after delays in getting 3380-type thin-film drives to market in volume. Survey respondents indicated that about 63% of their outlays for 3380 disk would go to IBM; Storage Technology captured 10%, Memorex 4%, and Control Data only 1%.

IBM LEADS IN TAPE DRIVE BIZ

The tape drive business, too, shows IBM in command, although the survey was conducted too early to gain any knowledge of how users would react to the new IBM 3480 tape cartridge drives introduced in March. IBM was seen as shipping 46% of the total tape drives to be ordered by respondents in the 1984-85 period, followed by a strong Storage Tech with 40%, Memorex with 4%, and Telex with 2%. Storage Tech's share of the tape drive market was seen as particularly high among high-end users (3033/308X) where it had a 56% share of the add-on market, compared to IBM's 36% share.

In add-on memory, IBM's pricing pressure has given it an 82% share, compared to 4% for Amdahl, 2% each for National Semiconductor and Storage Technology, and 1% for Control Data. Intel, which has held a 10% share in the 1980 mainframe survey, has apparently been squeezed out of the picture altogether.

In the terminals add-on market, respondents said that 60% of their acquisitions would be for IBM products, 8% from Telex, 6% each for Raytheon and ITT Courier, 2% for Memorex, and 18% other for unspecified. When asked if they expected to need additional system capacity by year-end 1984, respondents showed a slight increase in need compared to last year's survey. For instance, 26% said they would need to upgrade to larger cpus, 8% said they would need to install additional cpus, and 27% said they would have to add main memory or peripherals. Comparable figures from last year's survey were 25%, 7%, and 27%, respectively.

Among high-end users, however, even more demand for additional capacity is expected. Among 3081 and 3084 sites, 23% expect to need additional cpus and 36% to need to upgrade installed machines. The stage appears set for IBM's introduction of a new line of higher-performance mainframes.

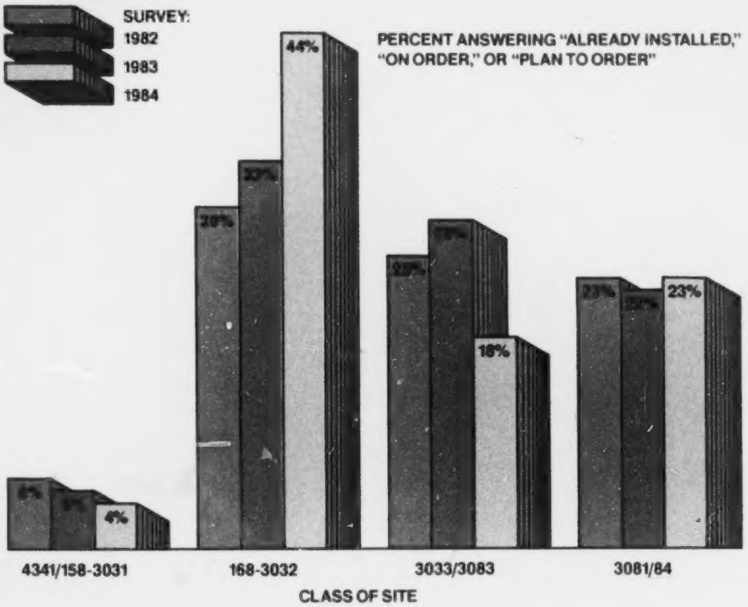
As seen in successive surveys over the past five years, the installation activity in 308X class machines appears to have crested and (in dollar terms) is being taken over by 4300s, particularly the 4361 and 4381. Looking ahead 24 months, respondents said they would spend 69% of their dollars on 308X machines, and 30% on 4300s. Last year's comparable figures showed 77% of the dollars going to 308X systems and 18% going to 4300s.

Meanwhile, the PC is expected by respondents to capture 21% of the dollars spent on dp systems compared to 79% on IBM mainframes. Last year those numbers were 7%

FIG. 2

PCM PROSPECTS

Query: What consideration has your organization given PCM cpus (e.g., Amdahl, NAS) as an alternative to your IBM cpu(s)?

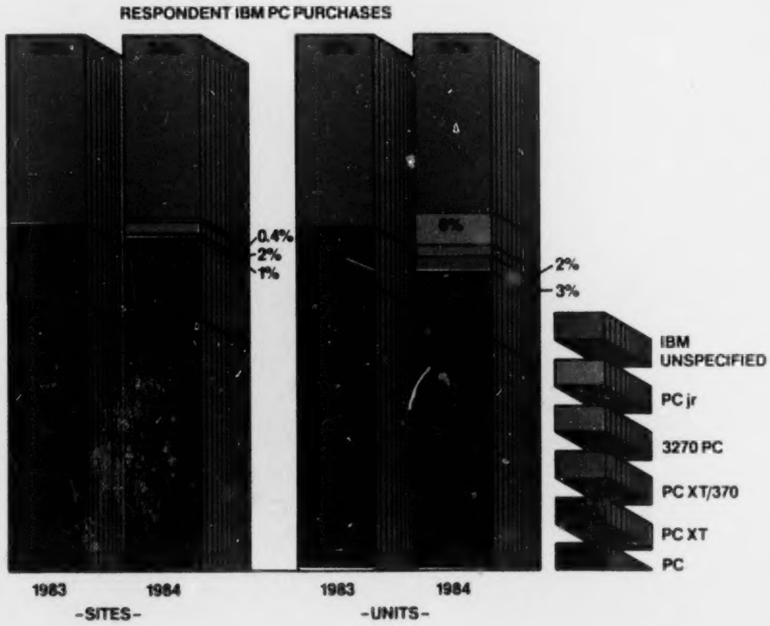


Note: Negligible impact in 4300 segment of IBM line

FIG. 3

IBM'S ORIGINAL PC VS. OTHER IBM MICROS

Query: How many personal computers were purchased by your organization during 1983 and how many are planned for 1984?



CHARTS BY PAUL GOODFRIEND

and 93%, respectively.

Personal computer purchases are coming most strongly from users in manufacturing and education SIC sectors, followed by government and business services. Standardization at the corporate level is found most evident in larger organizations; 70% of organizations with revenues of over $250 million a year have standardized on one or two pc suppliers, compared to the overall survey portion of 61%.

At the current rate of growth, therefore, the PC could easily catch up with mainframe shipment values in a few years. In fact, as a fraction of the annual incremental revenue growth experienced by the corporation, the PC is already close to matching the mainframe product line. On the other hand, pcs are seen as fueling mainframe demand because of the increasingly popular micro-mainframe links users are installing.

IBM's already imposing share of pc shipments to survey respondents is expected to rise even further in the coming year. The company accounted for 62.8% of all installed machines at the end of 1983 and was expected by users to account for 75% by the end of 1984. Comparable figures for Apple Computer, the next leading vendor in the corporate marketplace, are 18.5% last year and only 6.7% this year. Tandy's share was seen as dropping from 2.5% last year to only 0.5% this year, while Compaq, Wang, and HP showed slightly more significant standings.

Among the IBM PCs being acquired by survey respondents, the original model still accounts for the largest fraction of shipments, at least 43%. Following it are the XT model, with 13% of planned 1984 acquisitions, PCjr, with 6%, and the XT/370 with 3%. Fully a third of the IBM PCs mentioned by respondents were left unspecified.

Standardization on one or two brands of personal computer was more evident than ever, with 61% of the responding sites having made such a commitment. Survey results showed that the larger the organization the more likely standardization has become. Of those corporations standardizing, the IBM PC family was by far the most common choice, accounting for 72% of the mentions. Apple came next with 9%, followed by Digital Equipment with 3% and Tandy with 2%.

DDP CONTINUES TO EXPAND

Distributed processing, a concept more than a decade old, continues to expand among survey respondents. Looking ahead 24 months, almost two fifths of the respondents said they would have distributed processing systems installed, up significantly from the one quarter of sites currently involved. IBM's share of that business was seen as increasingly strong, rising to 83% of the expected shipments during 1984/85. Interestingly, Datapoint, once a leader in the business, was not mentioned for future installations. It has apparently suffered greatly at the hands of an aggressive IBM.

IBM, too, is gaining a strong share of the office automation business, being mentioned as the main OA supplier by just over half the sites planning to build mainframe-based OA systems. Use of the company's PROFS and DISOSS office systems, each of which runs on mainframe computers, was also found to be growing significantly among survey respondents.

In connecting office machines together, the local area network was found to be the leading choice over PBX systems, although only by a slight margin. Rolm's share of planned PBX installations was found to have taken a good-sized jump among IBM sites, apparently reflecting user confidence in the Rolm-IBM partnership which was disclosed since last year's mainframe survey. Of the PBXs to be installed at IBM sites, about one half are expected to come from Rolm, compared to 28% from AT&T and 10% from Northern Telecom. Last year's survey showed Rolm with only a 29% share of installed PBXs.

Usage of IBM's SNA continues to grow, penetrating almost a third of the IBM sites surveyed and expected to hit another 11% in the following two years. SNA was found to be particularly popular at large organizations.

Similarly, database management software finds its widest use among large sites while smaller sites (370/135-4341 range) show the largest growth rate for DBMS usage. The three winners in the DBMS marketplace appear to be Cullinet, Applied Data Research, and IBM, the latter selling its SQL relational package with significant success. IBM's IMS, however, is still the single most used DBMS package among IBM respondents.

As has been seen in previous surveys, a rising percentage of the total data processing budget—some 11.3% in this year's survey—goes for outside software packages. IBM was found to be capturing about 65% of those software expenditures, a figure showing little change from previous years.

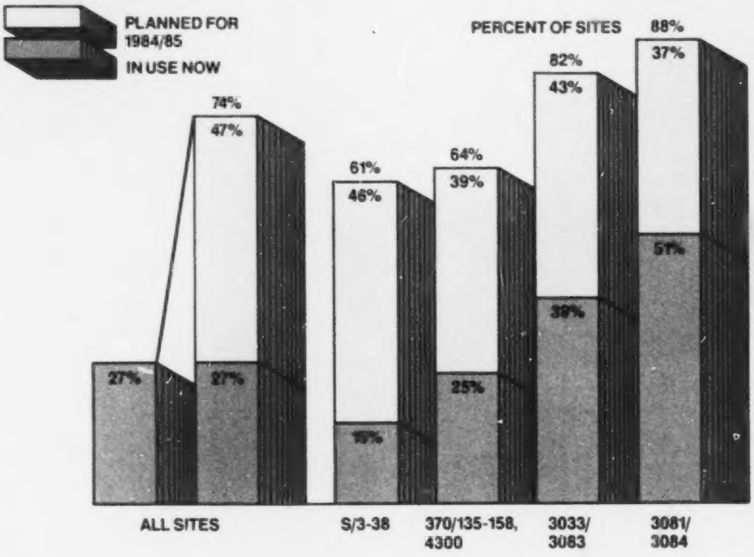
Conversion to the industry leader's MVS/XA operating system, which was first shipped in late March 1983, as a major extension to the decade-old MVS, is continuing strongly. While only 7% of responding MVS sites said they already use the software, a third said they would install it in 1984 or 1985. As expected, larger machine sites were more eager to install MVS/XA.

Turning to non-IBM sites, the appearance of high-end machines from such vendors as Honeywell and Sperry has apparently dampened, at least in the short term, growing

FIG. 4

MICRO-MAINFRAME LINKS

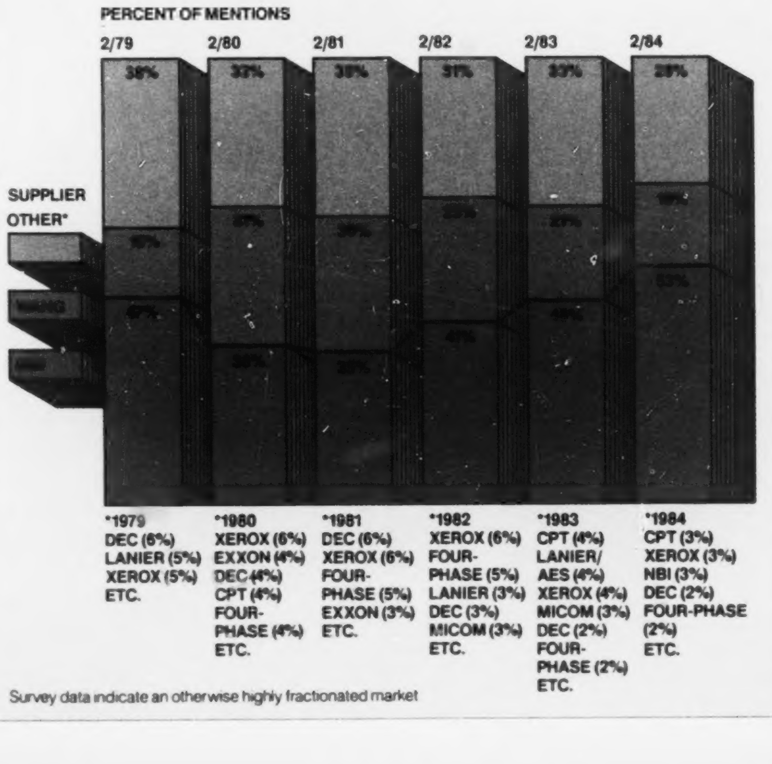
Query: What if any plans do you have for interconnecting personal computers with your mainframe system(s)?



*66% compound user base expansion

FIG. 5

WP/OFFICE SYSTEMS PROCUREMENTS



Survey data indicate an otherwise highly fractionated market user dissatisfaction. At Burroughs, for instance, only 16% of large systems users said they were seriously considering making a vendor switch, compared to 19% last year. At Sperry, the figures were 12% this year, down from 19% last year. At Honeywell, however, 30% of the users said they may switch, up from 24% last year.

Of those seriously considering making the switch, over half said they were looking to "the IBM world" for the future. In fact, 63% of those large system sites considering a switch picked IBM or an IBM pcm as a likely future supplier, followed by 16% citing DEC.

The lack of trained applications programmers for non-IBM mainframes was the most often cited reason in considering a switch to another vendor—in the case of large Sperry users, 56% complained of that lack.

However, survey data showed still relatively modest amounts of actual vendor switching activity by users. Competitive displacements seem to take place primarily in older, heavily purchased lines of small-scale equipment, although some switching has begun to take place in larger systems where IBM is seen as taking business from all vendors.

Burroughs users showed a continued warming to their supplier, a trend which has been noted in the annual survey for three years running now. The biggest shift was seen among distribution and government users while those in the educational market showed a negative shift in their sentiment toward the Detroit mainframer. Apparently, Burroughs efforts in concentrating on specific lines of businesses is paying off, but users expressed dissatisfaction with the comany's field force activities.

BURROUGHS USERS BUYING

As with IBM, Burroughs is experiencing a major shift to purchasing of its equipment. Among currently installed and planned installations, only 16% and 14% of the system value in dollars respectively are leased—the rest is purchased directly from Burroughs, leased from a third party, or installed under a five to seven year lease from Burroughs.

The largely dormant B6000 user base has apparently been sparked by the recently unveiled A9 machine from Burroughs. Nearly half the ordered A9s indicated by respondents are replacing B6800s and another fourth are being used to upgrade B1900 installations. Few B6900 users are moving to the new A9. Strong deliveries of the B4900 and B7900 are foreseen among respondents to the survey, but it is clear that further product introductions will have to be made to stimulate order rates in 1985.

Burroughs users also indicated that

FIG. 6

PABXS, LANS, OR BOTH?

Query: Which, PABX or LAN, is likely to be emphasized for your future local site data communications?

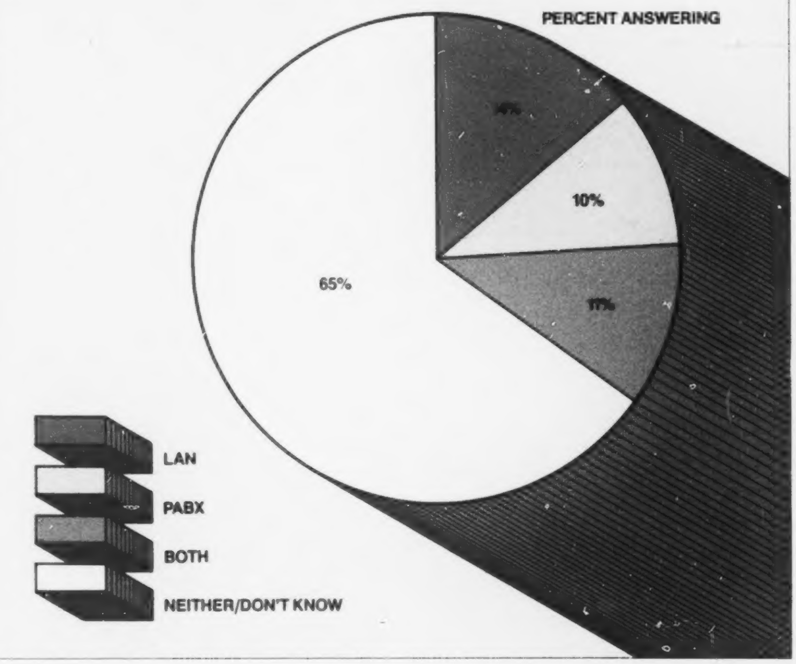
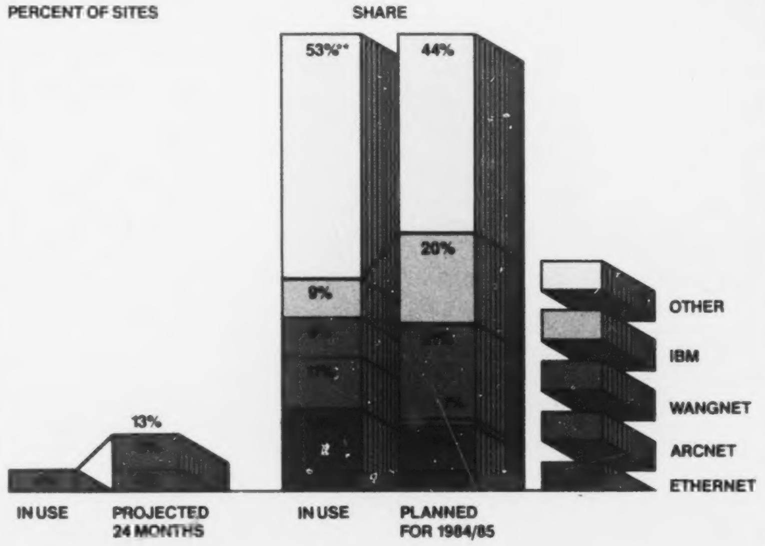


FIG. 7

LOCAL AREA NETWORK MARKET STILL FRACTIONATED

Query: If your organization has installed or plans to install a local area network (LAN), who is the supplier?



*80% compound user base expansion

**Includes Sytek (6%), Corvus (5%, 3% 1984/85), 3 COM (4%), Nestor (4%), Ungermann-Bass (3%, 4% 1984/85) they are buying the company's B20 workstation, a 16-bit machine manufactured by Convergent Technologies, but little interest has been expressed in the company's in-house developed Ofis 1 office automation systems. The strongest interest in the B20, which can be used as a standalone device or attached to a mainframe as a workstation, comes from B48/4900 and B7000 class users.

Add-on peripheral plans among Burroughs users appeared subdued for the second time in a row, a situation that may result from the relatively high rate of total system shipments in the recent past.

Honeywell Information Systems, which has shown weakness in previous years in delivering large-scale mainframe systems and which recently opted to sell such machines made by NEC in Japan, still has much work to do to satisfy its users' needs. Indeed, the threat of defections away from its user base remains a serious problem. Among large-scale users, 31% said their attitude towards Honeywell became less favorable during the past year, while of those using old, Level 62 equipment, which is effectively dead-ended, 45% said their attitude was less favorable. The most negative feelings were expressed by government customers.

Applications software is the most sensitive issue with Honeywell users, who decidedly rate the company's efforts as inferior to IBM and the industry as a whole. A good portion of the user base, however,—68% of the Level 66 and DPS 8 users, in fact—said they were planning to make the conversion to the new GCOS 8 virtual memory operating system, a conversion that is far from trivial. This faith in the system seems to bode well for future orders of DPS 88 machines.

Planned installations of mainframes was found to be rebounding among all Honeywell users, which means the company will bring in a certain amount of high-margin business, but that activity is still not ebullient. Add-on peripherals business for the coming year was up only a little, with Honeywell losing a significant amount of business to plug-compatible terminal suppliers.

Users are still making much use of the Level 6/DPS 6 minicomputer line as an adjunct to their mainframe installations. Almost half the large systems users said they already have used or will install the small machines. Like Burroughs, however, the company's efforts in the office automation field are finding small acceptance—only 13% of large users said they have installed or will install the firm's office systems.

After a rush of new orders in the second half of 1983, NCR appears to be on its way to a very healthy 1984. In fact, it looks as if the company will have to concentrate on producing and installing equipment rather

FIG. 8

DBMS ON IBM MAINFRAMES

Query: If you are using a DBMS software package on your IBM mainframe(s), which one?

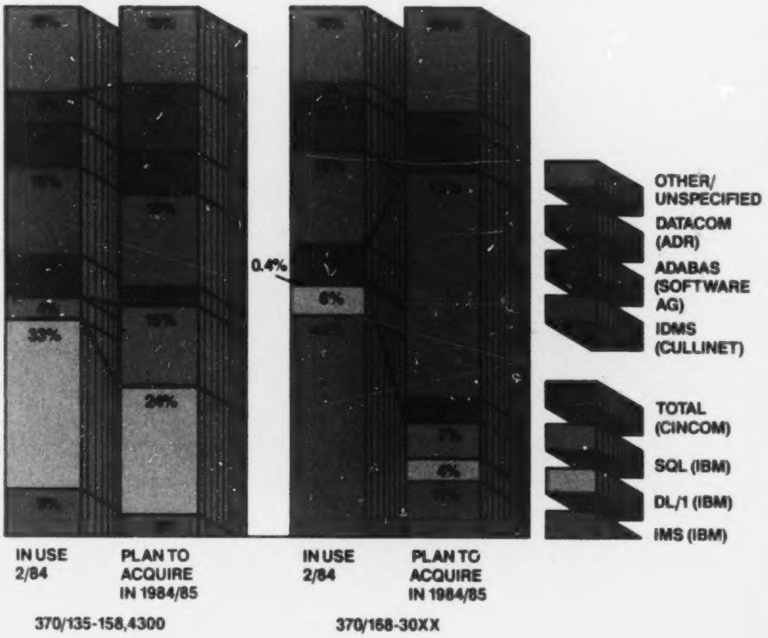
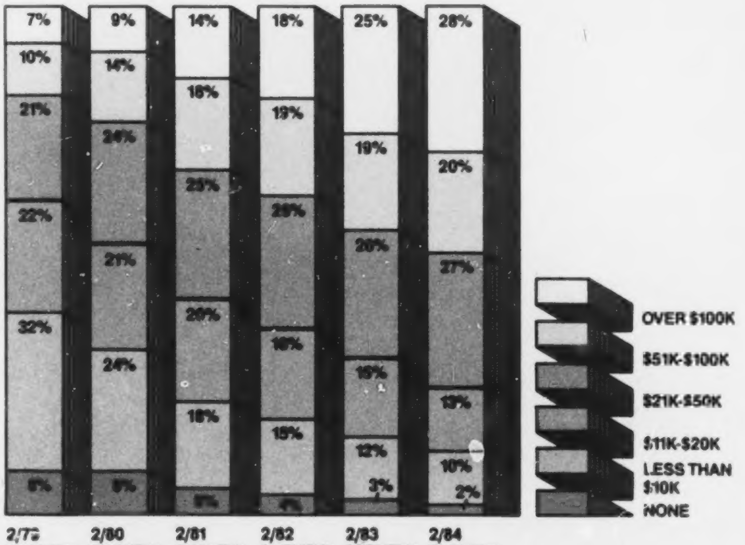


FIG. 9

OUTLAYS FOR PACKAGED SOFTWARE

Query: Approximately how much of your organization's annual dp budget currently goes for unbundled software from IBM and other outside software packages?



*Excludes System/3, 32 and 34, which had not been included in 77/78 survey sample.

IBM capturing 65% of respondents expenditures (66% in 1983 survey, 67% in 1982)

Planned installations of mainframes was found to be rebounding among Honeywell users.

than on seeking out orders. Of particular interest on the rapid takeoff of the new 9000 series of 32-bit machines, which are based on proprietary chips that the company is building for itself and selling on the merchant market. As of the time of this year's survey, fully 8% of the dollar value of the NCR-installed mainframe base was represented by 9000 series machines, which were to be 48% of planned installations.

The strengthening of the economy and the wide range of new products introduced by NCR last year have prompted a burst of installation activity among users. In terms of dollars, users said they would install in 1984/85 equipment worth 24% of their currently installed base. That figure is substantially up from the 11-12% range recorded in previous years. Moreover, the company seems to have begun a reversal of the user base erosion it experienced in previous years.

On the negative side, the firm's Worksaver product line, based on Convergent Technologies hardware, is not faring well among NCR mainframe users. A growing share of those users (some 20% in this year's survey) said they have considered the hardware but have no interest in using it, while a shrinking portion said they are planning to evaluate it. Only 7% said they will install the Worksaver systems. On the other hand, among those NCR users who have standardized on one or two personal computer vendors (a total of 44%), 42% have chosen NCR's Decision Mate systems, compared to 36% choosing IBM.

Sperry, whose high-end customers have been forced to wait while the company works out manufacturing problems in its long-promised 1100/90 machine, is serving a user base whose appetite for additional system capacity took a strong upturn in this year's survey. Looking ahead to 1985, 18% of all Sperry respondents said they would need to upgrade to a larger cpu (up from 12% last year) and 9% (up from 6%) said they would have to install additional cpus. Among large users, the comparable figures were 16% (9% in last year's survey) and 10% (level with last year). Undoubtedly, the resolution of the 1100/90 situation has encouraged users to assess their capacity needs more favorably. A particularly strong need for additional capacity in 1985 was recorded among 1100/60 users, many of whom have had their machines installed for five years or so and who will be installing 1100/70 machines.

The company's Sperrylink office automation system is apparently moving well into the user base, with 16% of all Sperry respondents saying they will install the system and another 23% planning to evaluate it. Among 1100/60 sites, 32% of the respondents said they would install Sperrylink.

Applications software is the most often cited negative aspect of Sperry's offerings when compared to those from IBM. Fully 60% of the users said they found Sperry's applications software inferior to the industry leader's; last year's figure was 53% in that category. While high-end users showed a distinct shift to a more positive attitude in general toward Sperry, those using the dead-ended 90 series machine expressed a new level of disgruntlement. ◆

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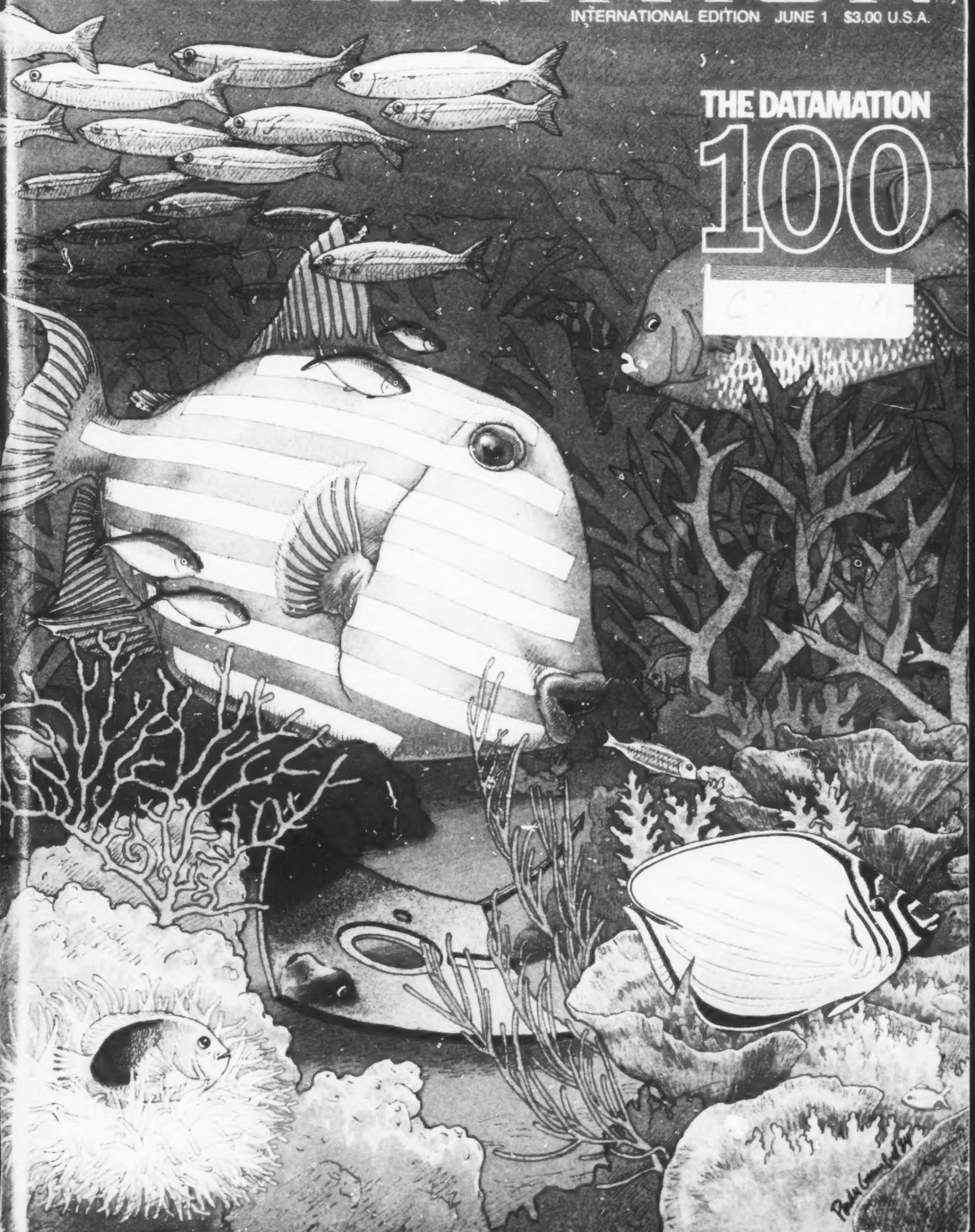

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THE DATAMATION 100: FATHOMING THE INDUSTRY

Pamela Archbold

Revenues for the Top 100 companies grew 18% to $91.8 billion in 1983, as all but two dozen of the firms reported earnings gains. Increased sales, combined with belt-tightening in personnel and R&D, seemed to be important in shaking off the effects of the recession.

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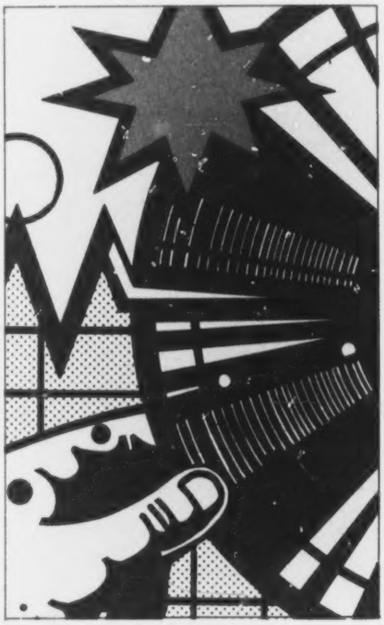

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COVER SCULPTURE BY KATHY JEFFERS/
PHOTOGRAPH BY WALTER WICK

FATHOMING THE INDUSTRY

by Pamela Archbold

The data processing industry burst through the surface of the recession, with revenues up and earnings advancing swimmingly in 1983. Total revenues for the DATAMATION 100 companies increased 18% to $91.8 billion. As for profits, the economic recovery also brought a brighter glow to the ledgers—only two dozen companies showed earnings declines in 1983, compared to double that number for the prior year. The improvement in bottom lines came as a result of cost-cutting as well as increased sales.

The industry learned during the recession that lean was as important as mean. Few companies allowed employment to grow significantly and few companies increased research and development expenses lavishly. Another lesson can be seen in the growth in the number and size of niche companies supplying a few high-volume components or focusing on large end-user markets. Some of the largest percentage performance increases in DATAMATION 100 companies were posted by the niche players.

To qualify for the DATAMATION 100 a company needed data processing revenues of at least $94.5 million, up 27% from the prior year's minimum of $74.3 million (see Methodology, p. 57). The largest company, of course, is IBM, with $35.6 billion in dp revenues, showing a renewed growth rate and displaying the aggres-

ILLUSTRATION BY PONDER GOEMBEL

Revenues and profits rebounded after the recession, but a shakeout looms.

FIG. 1

MAINFRAME REVENUES

($ MILLIONS)

RANK	COMPANY	1983 REVENUES ($ MILLIONS)	1982 REVENUES ($ MILLIONS)	% CHANGE
1	**IBM**	11,443.6	10,661.8	7.3
2	**Burroughs Corp.**	2,000.0	2,000.0	NM
3	**Honeywell Inc.**	1,020.1	1,060.0	−3.7
4	**NCR Corp.**	1,000.0	1,100.0	−9.0
5	**Control Data Corp.**	775.0	705.0	9.9
6	**Sperry Corp.**	700.0	728.8	−3.9
7	**Amdahl Corp.**	570.7	412.0	38.5
8	**National Semiconductor**	200.5	175.0	14.5
9	**Cray Research Inc.**	169.7	141.1	20.2
				AVERAGE: 8.20

NM: not meaningful

FIG. 2

MINI REVENUES

RANK	COMPANY	1983 REVENUES ($ MILLIONS)	1982 REVENUES ($ MILLIONS)	% CHANGE
1	**Digital Equipment Corp.**	2,700.0	2,500.0	8.0
2	**IBM**	2,627.0	2,945.0	−10.7
3	**Burroughs Corp.**	950.0	900.0	5.5
4	**Wang Laboratories Inc.**	892.9	660.0	35.2
5	**Hewlett-Packard Co.**	736.3	655.0	12.4
6	**Data General Corp.**	705.0	670.0	5.2
7	**Prime Computer Inc.**	416.5	351.0	18.6
8	**Tandem Computers Inc.**	400.0	295.0	35.5
9	**Gould Inc.**	334.0	325.0	2.7
10	**Honeywell Inc.**	330.0	330.0	NM
11	**Texas Instruments Inc.**	310.0	300.0	3.3
12	**Perkin-Elmer Corp.**	225.0	205.2	9.6
13	**Management Assistance**	211.5	201.5	4.9
14	**NCR Corp.**	210.0	120.0	75.0
15	**Mohawk Data Sciences Corp.**	168.0	149.0	12.7
				AVERAGE: 14.53

NM: not meaningful

siveness of a company a fraction its size. Again in second place is Digital Equipment with $4.8 billion in dp revenues.

A number of companies made their first appearance in the DATAMATION 100 in 1983. Included in this group are PBX and terminal maker Mitel, at number 49. Intel, known primarily as a chip maker, has developed a budding dp business, and made it to the list at number 66. Cullinet profited from the increased need for micro-to-mainframe links and entered the Datamation 100 at number 94. Other new entrants include Canada Systems Group, number 92; Docutel/Olivetti, number 96; and Mead Corp., number 100. Compaq, the portable personal computer maker, had the most startling growth of any dp company last year, starting 1983 with no revenues and ending up the year with sales of $111.2 million; this record brought Compaq into the Top 100 at number 91.

Leaving the ranks of the leading dp companies were General Automation, Modular Computer, Anacomp, and Comshare. Lanier also leaves, as it was merged with Harris Corp. Tymshare's merger with McDonnell Douglas took place in 1984, so it's still included in 1983's rankings.

The results of the ninth annual DATAMATION survey of the domestic dp industry show a much healthier business than was the case in 1982, when 40 companies reported an earnings decline. In 1983 the number of companies with earnings declines shrank to 23, and many of these companies were conglomerates whose dp units fared fine while other business segments suffered. Among the members of this group are Allied Corp., General Electric, General Instrument, Gould, Schlumberger, and Signal Cos. Other companies, such as Apple, however, foundered on their dp efforts alone.

One sector of the hardware business suffered a public ordeal last year. Microcomputers cut into the sales of minicomputers, and price competition and widely publicized internal problems hurt Prime and DEC, as both were under earnings pressure. Other companies having difficulties included NBI, Paradyne, Management Assistance, Tektronix, and General Instrument. Everything from the collapse of the video game business to increased competitive pressure from IBM to government investigations affected this group. Check the profiles following this article for the gory details.

The number of companies reporting losses was high during 1982 but declined last year. During 1982 seven companies were in the red but in 1983 only five DATAMATION 100 companies lost money. AT&T, of course, was the big loser with its $5 billion write-off for obsolete hardware as it entered the computer industry in a big way. StorageTek was also pushed into the red by a big product write-off. In the doldrums for both years were Centronics and Tymshare. Docutel/Olivetti was in the red due to difficulties in its 1981 merger and weaknesses in its office automation product line.

RISE OF THE MICRO

Indeed, the rise of the microcomputer has been a two-edged sword for the $92 billion-plus industry. No advance has changed the industry more than the microcomputer. This revolution continued during 1983 with the micro manufacturers surging ahead in the Top 100 rankings. Apple Computer posted calendar 1983 revenues of $1.08 billion, and reached number 11. Following closely behind were Tandy, with dp revenues of $945 million, at number 13, and Commodore, at number 14, with revenues of $926 million.

The growth of these companies and the other vendors with important micro lines effectively pushed the mini makers down on the DATAMATION 100 list.

The micro influence was felt throughout the entire industry because a new breed of company has evolved in the dp business, the

FIG. 3

MICRO REVENUES

RANK	COMPANY	1983 REVENUES ($ MILLIONS)	1982 REVENUES ($ MILLIONS)	% CHANGE
1	**IBM**	2,600.0	500.0	420.0
2	**Apple Computer Inc.**	1,084.7	664.0	63.3
3	**Commodore**	926.7	367.8	151.9
4	**Tandy Corp.**	598.0	466.2	28.2
5	**Hewlett-Packard Co.**	399.4	258.0	54.8
6	**Digital Equipment Corp.**	300.0	200.0	50.0
7	**Texas Instruments Inc.**	150.0	233.0	−35.6
8	**Compaq Computer Corp.**	111.2	NA	NM
9	**Wang Laboratories Inc.**	100.0	NA	NM
10	**NCR Corp.**	83.2	NA	NM

AVERAGE: 73.3

NM: not meaningful NA: not available

FIG. 4

OFFICE SYSTEMS REVENUES

RANK	COMPANY	1983 REVS ($ MILLIONS)	1982 REVS ($ MILLIONS)	% CHANGE
1	**IBM**	1,600.0	2,000.0	−20.0
2	**Wang Laboratories Inc.**	800.0	661.5	20.9
3	**Motorola Inc.**	287.8	274.9	4.6
4	**Harris Corp.**	275.0	241.2	14.0
5	**Burroughs Corp.**	250.0	200.0	25.0
6	**Xerox Corp.**	230.0	160.0	43.7
7	**Digital Equipment Corp.**	200.0	100.0	100.0
8	**Exxon Office Systems Inc.**	200.0	165.0	21.2
9	**CPT Corp.**	192.1	158.5	21.1
10	**Philips Info. Systems**	175.0	176.0	−0.5
11	**NBI Inc.**	140.8	119.5	17.8
12	**NCR Corp.**	85.0	53.4	59.1

AVERAGE: 21.3

FIG. 5

DP EMPLOYMENT

THOSE WHO STAFFED UP

RANK	COMPANY	1983 DP EMPL	1982 DP EMPL	% CHANGE
1	**Compaq Computer Corp.**	614	96	539.5
2	**Seagate Technology**	2,100	339	519.4
3	**Convergent Technologies**	1,000	450	122.2
4	**Televideo Systems Inc.**	867	491	76.5
5	**Micom Systems Inc.**	1,559	915	70.3
6	**NEC Info. Systems**	650	400	62.5
7	**Verbatim Corp.**	2,840	1,790	58.6
8	**NBI Inc.**	1,665	1,096	51.9
9	**Cullinet Software Sys.**	1,050	706	48.7
10	**Mead Corp.**	1,040	700	48.5

micro component supplier. Niche companies like Tandon, SCI, and Seagate specialize in one product, such as disk drives, and are able to achieve fast growth because of low production costs and the astounding demand for personal computing power. During 1983 these niche players were among the fastest growing firms (see Fig. 7, p. 56).

It can be said that IBM is a primary factor behind the growth of niche companies. When it found itself without a personal computer in 1981, Big Blue decided to get one in a hurry by taking off-the-shelf parts and hiring outside contractors like SCI for subassembly. IBM took a shortcut from its normal demanding route of vertical integration to take advantage of the market window. SCI is a prime example of a niche company making good. During 1981 it achieved $15 million in dp sales, but by 1983 dp revenues had increased to $225 million.

The IBM decision to outsource subassembly of a product line to make a faster entry into the desktop market was quickly expanded upon by the rest of the dp industry. Vendors caught short without a microcomputer or intelligent workstation product arrived en masse in Silicon Valley, looking for a supplier to private label a desktop system for them.

A prime beneficiary was Convergent Technologies. Seeing the success of Burroughs with its use of Convergent Technologies' workstation—about 46% of CT's $164 million in revenues was from Burroughs—other mainframers and older dp vendors opted for using outside systems suppliers. Convergent added a number of new customers, as companies like TRW, Basic Four, Raytheon, Mohawk Data, AT&T, Prime, and NCR signed purchase orders.

While niches are becoming fashionable in manufacturing, one of the earliest dp niches faces extinction. Nothing seems to help the remote services industry maintain the torrid growth and earnings momentum of the past. It's no secret that the remote computer services industry has been heavily hit by microcomputers. This is evident in the DATAMATION 100 rankings. General Electric reports that its GEISCO division was off 8%, causing GE to decline from the number 13 spot to number 18. Computer Sciences dropped from 18 to 23, while EDS slipped from 21 to 24. Boeing was the only remote services company that was able to move up, going from number 55 in 1982 to number 48 in 1983. As mentioned above, both Anacomp and Comshare declined in revenues and fell off the list.

The mainframe software companies, however, were booming, in part due to the rising demand from microcomputer owners. Management Science America moved up in

The microcomputer software companies exhibited strength, but did not keep pace with the micro hardware manufacturers.

the rankings due to the strength of its Peachtree Software Division. Cullinet joined the DATAMATION 100 for the first time.

While the micro software companies exhibited strength, they did not keep pace with the volume and revenue growth of the microcomputer hardware manufacturers and component suppliers. The revenues of Lotus, Microsoft, and VisiCorp were in the $50 million range last year, which was only half the revenue of the company ranked lowest in the DATAMATION 100. The achievement of Lotus in selling $50 million worth of its 1-2-3 integrated software package pales beside the $111.2 million that Compaq racked up with its IBM-compatible portable. The widely predicted shakeout and consolidation of the micro software industry will undoubtedly put Lotus and other companies into the DATAMATION 100 next year.

MERGERS IN 1983

Consolidation in the rest of the industry continued as the pace of mergers and acquisitions quickened in 1983. The biggest merger was the $275 million that Harris paid for Lanier. Martin Marietta Data Systems expanded its product line by buying Mathematica and its RAMIS database management system. McDonnell Douglas made two smaller acquisitions and early in 1984 succeeded in buying Tymshare.

A number of companies bought pieces of other companies: AT&T, for instance, purchased 25% of Olivetti. The big surprise of the year, however, was IBM's purchase of 20% blocks of stock in Intel and later Rolm, after its quickie relationship with Mitel. For a company that adhered to the not-invented-here syndrome, IBM's moves to buy into other companies to ensure itself of technology and expand its product line was a remarkable event.

For Intel, the IBM investment helped finance additional chip production, much of which would be sold to IBM. After many years of marketing a modest office PBX, IBM's interest in fleshing out its office automation product line led to Mitel first, but IBM abandoned the Canadian-based company when development problems slowed the introduction of Mitel's voice and data switch.

A number of companies sold operations during the year. Dysan was the biggest seller, picking up $41 million when it sold half of its holdings in Seagate Technologies. A host of other micro companies actually went bankrupt or came close. While executives at Fortune Systems, Victor Technologies, and Vector Graphic all had aspirations of entering the Top 100 as 1983 dawned, by year-end their biggest dream was keeping their firms operating.

Concern about keeping costs under

FIG. 6

DP EMPLOYMENT

THE 10 WHO CUT THE MOST

RANK	COMPANY	1983 EMPL	1982 EMPL	% CHANGE
1	**Tandon Corp.**	1,700	2,500	−32.0
2	**Harris Corp.**	22,000	26,000	−15.3
3	**Centronics Data**	1,700	2,000	−15.0
4	**Tektronix**	20,605	22,924	−10.1
5	**Planning Research**	5,600	6,200	−9.6
6	**National Data Corp.**	2,253	2,458	−8.3
7	**Tymshare**	3,302	3,600	−8.2
8	**Floating Point Systems**	1,319	1,390	−5.1
9	**McDonnell Douglas**	7,177	7,500	−4.3
10	**Diebold**	5,824	6,051	−3.7

FIG. 7

THE WINNERS

RANK	COMPANY	1983 DP REVENUES ($ MILLIONS)	1982 DP REVENUES ($ MILLIONS)	% CHANGE
1	**Compaq Computer Corp.**	111.2	NA	NM
2	**Seagate Technology**	221.0	57.0	287.7
3	**SCI Systems Inc.**	225.0	80.0	181.2
4	**Commodore**	926.7	367.8	151.9
5	**Tandon Corp.**	343.9	177.1	94.1
6	**Harris Corp.**	580.0	332.5	74.4
7	**Televideo Systems Inc.**	168.7	98.5	71.2
8	**Cullinet Software Systems Inc.**	108.0	63.6	69.8
9	**Convergent Technologies**	163.5	96.5	69.4
10	**Amdahl Corp.**	777.7	462.2	68.2

NA: not available
NM: not meaningful

FIG. 8

THE LOSERS

RANK	COMPANY	1983 DP REVENUES ($ MILLIONS)	1982 DP REVENUES ($ MILLIONS)	% CHANGE
1	**Storage Technology**	886.6	1,079.2	−17.8
2	**Signal Co.**	160.0	177.3	−9.7
3	**Texas Instruments Inc.**	850.0	900.0	−5.5
4	**General Electric**	820.0	862.0	−4.8
5	**Planning Research**	135.6	138.4	−2.0
6	**Philips Info. Systems**	200.0	203.0	−1.4
7	**Honeywell Inc.**	1,666.1	1,684.7	−1.1
8	**Sperry Corp.**	2,799.6	2,802.9	−0.1

control put more pressure than expected during a recovery on the research and development budgets at many dp vendors. The biggest single project cutback was based on technological prudence, not bean counter insistence. IBM canceled its long-standing research into Josephson junctions. Wall Street analysts estimate that IBM spent up to $150 million on this project, but since IBM is so huge, this expense didn't cause a blip on its profit and loss statement. That wasn't the case at DEC and StorageTek, where canceling projects also canceled some earnings. At Storage Tek, the cancellation of its CMOS mainframe cost the company about $65 million, but the investors looking for a tax shelter ended up with a wipeout. This cancellation may eventually cost a lot more because the research partners have instituted a lawsuit against StorageTek.

One particularly thorny issue in their suit is the fact that StorageTek told them that all was well just a few short weeks before it canceled the project. Meanwhile, on the other coast, DEC caused a fury among its users by dropping its research on the Jupiter project to upgrade the DECsystem 10 and 20 mainframes. This change of mind cost DEC an estimated $50 million.

The future looks ominous to many hardware vendors, in part because of high interest rates, but mostly because of the entry of American Telephone and Telegraph into the marketplace with competitive minicomputers and a strong software head start with its Unix operating system. Confusion over whether Unix will become a de facto standard in multi-user environments, and IBM's reaction to that possibility, led many dp managers to wonder about the future of their corporations' expenditures for MS/DOS-driven personal computers.

In last year's overview for the 1982 DATAMATION 100, we suggested that the data processing industry's challenge would be to react nimbly to quickly changing conditions. The industry did indeed face an enormous amount of turmoil, and seemed to heed our advice, as profitability improved greatly. In the coming year, the most successful companies should be those that meet the burgeoning demand for enduser computing and resolve the standards dilemmas. ✻

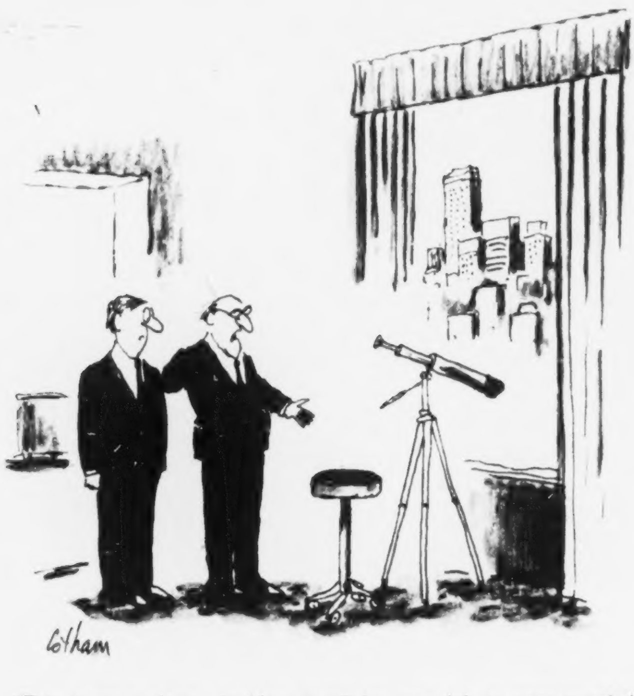
METHODOLOGY

Throughout the year, DATAMATION tracks over 175 companies on a worldwide basis. Our survey is meant to be used as a comparative analysis, and therefore all revenues and earnings figures have been adjusted to calendar year calculations. Because over half of the companies covered operate on a fiscal year that does not coincide with the calendar year, their revenues and earnings for purposes of this survey have been derived from quarterly reports. Numbers relating to R&D expenditures and total number of employees, however, are reported as of each company's fiscal year-end.

During 1983, a number of Top 100 companies restated their performance figures, whether to reflect changed accounting methods, mergers, spinoffs, or just plain errors in earlier reports. While each chart and table within the survey incorporates the restated numbers, we do not alter the prior year's ranking for the companies concerned even though in some cases the restatements would have moved a company up or down a few notches.

Also, please note that a company's internal sales, or sales made to other divisions or units within the company, are excluded from the year's total dp revenues, as they are considered captive and not commercial sales.

For purposes of the survey, dp-related revenue is defined as general purpose dp products and services generated by one or more of the following categories of equipment: mainframes, minicomputers, microcomputers, office systems, data communications, peripherals and terminals, software and services, and maintenance and repair. Explicitly excluded are data transmission or "basic" services revenues from specialized common carriers; standalone electronic and mag card typewriters and standalone electronic cash registers; instrumentation; semiconductors; printed circuit boards; automatic test equipment; and dp supplies, with the exception of magnetic media for disk and tape drives. All peripherals that attach to a system are included. For computer-based manufacturing systems, such as computer-controlled machine tools, only the computer and hard-copy output devices are included and not the machine tool itself.



"This is your place, Jenkins. It will be your job to spot trends."

CARTOON BY FRANK COTHAM

Reprints of the DATAMATION 100 survey, including individual company profiles, are available in quantities of 100 or more. Details may be obtained by telephoning Mary Ann Hariton, (212) 605-9729 or by writing to DATAMATION, 875 Third Ave., New York, NY 10022.

THE DATAMATION 100

THE LEADING U.S. DP COMPANIES

1983 RANK	1982 RANK	COMPANY	1983 TOTAL REVENUE	1983 DP REVENUE	1982 DP REVENUE	DP REV % GROWTH	DP REV AS % OF TOTAL
1	1	International Business Machines	$40,180.0	$35,603.0	$29,265.0*	21.6%	88.6%
2	2	Digital Equipment Corp.	4,826.9	4,826.9	4,018.8	20.1	100.0
3	3	Burroughs Corp.	4,389.7	4,000.0	3,848.0	3.9	91.1
4	4	Control Data Corp.	4,580.0	3,500.0	3,301.0	6.0	76.4
5	5	NCR Corp.	3,731.0	3,333.2	3,149.1*	5.8	89.3
6	6	Sperry Corp.	4,745.3	2,799.6	2,802.9*	−0.1	58.9
7	7	Hewlett-Packard Co.	4,858.0	2,496.0	2,218.0*	12.5	51.3
8	9	Wang Laboratories Inc.	1,792.9	1,792.9	1,321.5	35.6	100.0
9	8	Honeywell Inc.	5,753.1	1,666.1	1,684.7	−1.1	28.9
10	10	Xerox Corp.	8,463.5	1,200.0	1,000.0*	20.0	14.1
11	19	Apple Computer Inc.	1,084.7	1,084.7	664.0	63.3	100.0
12	14	TRW Inc.	5,493.0	1,015.0	825.0	23.0	18.4
13	16	Tandy Corp.	2,703.8	945.0	725.0	30.3	34.9
14	29	Commodore International Ltd.	1,042.3	926.7	367.8	151.9	88.9
15	11	Storage Technology Corp.	886.6	886.6	1,079.2	−17.8	100.0
16	15	Data General Corp.	867.1	867.1	803.8	7.8	100.0
17	12	Texas Instruments Inc.	4,580.0	850.0	900.0*	−5.5	18.5
18	13	General Electric Co.	26,797.0	820.0	862.0	−4.8	3.0
19	17	Automatic Data Processing Inc.	816.5	816.5	704.0	15.9	100.0
20		American Telephone & Telegraph	69,403.2	807.1	802.2	0.6	1.1
21	53	Northern Telecom Inc.	2,610.2	807.0	754.8*	6.9	42.4
22	26	Amdahl Corp.	777.7	777.7	462.2	68.2	100.0
23	18	Computer Sciences Corp.	718.9	718.9	683.4	5.1	100.0
24	21	Electronic Data Systems	718.8	718.8	555.6	29.3	100.0
25	20	ITT Corp.	20,200.0	600.0	525.0*	14.2	2.9
26	34	Harris Corp.	1,642.2	580.0	332.5*	74.4	35.3
27	27	Rolm Corp.	549.3	549.3	447.7	22.6	100.0
28	22	Datapoint Corp.	547.8	547.8	512.9*	6.8	100.0
29	24	McDonnell Douglas Corp.	8,000.1	542.5	476.4	13.8	6.7
30	25	Comdisco Inc.	538.0	538.0	491.4*	9.4	100.0
31	28	Prime Computer Inc.	516.5	516.5	435.8*	18.5	100.0
32	23	Motorola Inc.	4,328.0	514.0	484.9	6.0	11.8
33	33	Tandem Computers Inc.	450.5	450.5	335.3*	34.3	100.0
34	30	National Semiconductor	1,385.0	425.5	365.0	16.5	30.7
35	35	Computervision Corp.	400.4	400.4	325.2	23.1	100.0
36	31	Management Assistance Inc.	388.2	388.2	354.2	9.5	100.0
37	37	Racal Data Communications Inc.	387.0	387.0	300.0	29.0	100.0
38	32	Mohawk Data Sciences Corp.	400.0	382.0	349.0*	9.4	95.5
39	41	C. Itoh Electronics Inc.	440.3	360.3	290.6	23.9	81.8
40	54	Tandon Corp.	343.9	343.9	177.1	94.1	100.0
41	39	Dataproducts Corp.	343.5	343.5	311.4*	10.3	100.0
42	36	Gould Inc.	1,324.8	334.0	325.0	2.7	25.2
43	37	Tektronix Inc.	1,208.8	300.0	300.0	NM	24.8
44	40	Tymshare Inc.	288.6	288.6	271.6*	6.2	100.0
45	42	Raytheon Corp.	5,937.3	285.0	283.0	0.7	5.0
46	44	3M	7,039.0	260.0	225.0	15.5	3.6
47	63	Intergraph Corp.	252.0	252.0	155.6	61.9	100.0
48	55	Boeing Co.	11,129.0	250.0	171.0	46.1	2.2
49		Mitel Corp.	241.0	241.0	181.7	32.6	100.0
50	61	NEC Information Systems Inc.	230.0	230.0	160.0	43.7	100.0

Ranking is by dp revenue in millions of dollars. *Restated figure NA: not available NM: not meaningful

1983 EMPL	1982 EMPL	DP REV PER EMP (DOLLARS)	R & D		NET INCOME	RETURN ON ASSETS	% DP REV FROM FOREIGN SOURCES	FISCAL YEAR END
			1983 ($ MILLIONS)	% OF TOT REV				
369,545	364,796	96.3	3,582	8.9	5,485.0	14.7	38.0	Dec.
78,500	68,000	61.4	544	11.2	262.1	5.7	36.0	June
64,000	62,000	62.5	248	5.6	196.9	4.7	NA	Dec.
55,858	56,000	62.6	270	5.9	161.7	1.8	33.0	Dec.
62,000	63,000	53.7	257	6.9	287.7	8.5	46.0	Dec.
43,738	42,356	64.0	296	6.2	176.7	3.3	33.0	March
72,000	68,538	34.6	494	10.1	432.0	10.3	41.3	Oct.
NA	19,700	NA	117	6.5	179.0	10.6	33.0	June
94,062	93,514	17.7	428	7.4	231.2	4.9	26.0	Dec.
107,100	109,940	11.2	555	6.5	466.4	5.0	NA	Dec.
4,582	3,400	236.7	71	6.5	59.0	10.6	25.0	June
88,374	85,099	11.4	133	2.4	205.2	6.1	24.0	Dec.
32,000	31,000	29.5	NA	NA	278.5	10.5	17.0	June
NA	4,100	NA	37	3.5	65.8	NA	35.0	June
NA	NA	NA	NA	NA	−40.9	−31.5	20.0	Dec.
15,400	14,765	56.3	84	9.7	29.0	3.4	34.0	Sept.
80,696	80,007	10.5	301	6.5	145.4	5.3	NA	Dec.
340,000	367,000	2.4	NA	NA	1,817.0	7.8	NA	Dec.
15,500	15,000	52.6	29	3.6	68.7	9.7	NA	June
NA	NA	NA	NA	NA	−4,874.7	NA	NA	Dec.
39,318	34,449	10.0	256.6	10.0	212.0	10.7	NM	Dec.
6,600	6,000	117.8	101	13.0	46.5	8.2	NA	Dec.
13,200	13,700	54.4	NM	NA	15.9	4.4	NA	April
13,500	13,148	53.2	NM	NA	67.4	16.6	2.0	June
278,000	283,000	2.1	1,024	5.0	674.5	4.9	NA	Dec.
22,000	26,000	26.3	90	5.5	63.7	4.6	30.0	June
7,604	6,020	72.2	41	7.5	34.1	4.2	NA	July
8,914	8,822	61.4	47	8.6	13.0	2.2	NA	July
7,177	7,500	75.5	NM	NA	274.9	5.7	14.2	Dec.
450	350	1,195.5	NM	NA	49.0	5.0	NA	Sept.
6,000	6,000	86.0	51	9.8	32.5	8.6	NA	Dec.
38,800	78,800	5.7	336	7.7	244.0	7.5	NA	Dec.
NA	3,600	NA	39	8.7	33.7	13.9	NA	Sept.
40,000	38,267	10.6	114	8.2	24.2	2.8	NA	May
5,000	4,130	80.0	43	10.9	35.3	10.1	NA	Dec.
6,049	5,800	64.1	18	4.6	1.0	0.4	44.2	Sept.
4,900	4,800	78.9	NA	NA	NA	NA	26.0	March
5,500	5,400	69.4	23	5.7	9.6	2.6	35.0	April
1,140	800	316.0	NA	NA	NA	NA	45.0	Dec.
1,700	2,500	202.2	16	4.7	27.2	8.7	7.0	Sept.
5,500	4,300	62.4	NA	NA	19.1	7.6	NA	March
20,651	19,976*	16.1	111	8.4	79.2	4.9	13.0	Dec.
20,605	22,924	14.5	131	10.8	48.3	4.4	36.9	May
3,302	3,600	87.4	NA	NA	−1.6	−6.1	NA	Dec.
76,100	72,000	3.7	NA	NA	300.1	8.0	NA	Dec.
85,847	87,388	3.0	384	5.4	667.0	11.5	NA	Dec.
2,500	1,800	100.8	28	11.1	29.3	NA	29.0	Dec.
84,600	95,700	2.9	NA	NA	355.0	4.7	71.0	Dec.
NA	NA	NA	28	11.8	NA	NA	NA	March
650	400	353.8	NA	NA	NA	NA	NA	March

THE DATAMATION 100

THE LEADING U.S. DP COMPANIES

1983 RANK	1982 RANK	COMPANY	1983 TOTAL REVENUE	1983 DP REVENUE	1982 DP REVENUE	DP REV % GROWTH	DP REV AS % OF TOTAL
51	45	Perkin-Elmer Corp.	1,066.6	225.0	205.2*	9.6	21.0
52	95	SCI Systems Inc.	300.1	225.0	80.0	181.2	74.9
53	51	Telex Corp.	306.6	221.7	194.7	13.8	72.3
54		Seagate Technology	221.0	221.0	57.0	287.7	100.0
55	57	Shared Medical Systems Corp.	210.8	210.8	165.7	27.2	100.0
56	60	General Instrument Corp.	891.7	210.0	163.0	28.8	23.5
57	48	Paradyne Corp.	209.0	209.0	207.3	0.8	100.0
58	58	Exxon Corp.	94,591.0	200.0	165.0	21.2	0.2
59	50	M/A-Com	654.4	200.0	200.0	NM	30.5
60	49	Philips Information Systems	200.0	200.0	203.0	−1.4	100.0
61	46	Sanders Associates	646.5	200.0	175.0*	14.2	30.9
62	56	Informatics General Corp.	197.9	197.9	170.2*	16.2	100.0
63	62	CPT Corp.	192.1	192.1	158.5	21.1	100.0
64	75	Dun & Bradstreet Corp.	1,616.9	185.0	132.4	39.7	11.4
65	68	Dysan Corp.	180.0	180.0	142.8	26.0	100.0
66		Intel Corp.	1,121.9	175.0	140.0	25.0	15.5
67	72	Continental Telecom Inc.	2,101.3	174.8	139.3	25.4	8.3
68	69	Cray Research Inc.	169.7	169.7	141.1	20.2	100.0
69	88	Televideo Systems Inc.	168.7	168.7	98.5	71.2	100.0
70	65	BASF Systems Corp.	165.0	165.0	150.0	10.0	100.0
71	73	Centronics Data Computer Corp.	164.1	164.1	138.4	18.5	100.0
72	89	Convergent Technologies Inc.	163.5	163.5	96.5	69.4	100.0
73	65	Diebold Inc.	445.9	160.0	150.0	6.6	35.8
74	59	Signal Cos.	6,151.0	160.0	177.3*	−9.7	2.6
75	84	Gerber Scientific Inc.	159.1	159.1	114.7*	38.7	100.0
76	77	Martin Marietta Corp.	3,899.3	154.0	125.0*	23.2	3.9
77	78	Quotron Systems Inc.	153.8	153.8	120.9	27.2	100.0
78	70	Wyly Corp.	153.0	153.0	140.5	8.8	100.0
79	67	Allied Corp.	10,022.0	152.2	147.1	3.4	1.5
80	87	Verbatim Corp.	147.0	147.0	98.6	49.0	100.0
81	86	Management Science America Inc.	145.2	145.2	101.2	43.4	100.0
82	79	Reynolds & Reynolds	263.9	145.0	120.0*	20.8	54.9
83	71	Nixdorf Computer Corp.	141.1	141.1	140.0	0.7	100.0
84	81	NBI Inc.	140.8	140.8	119.5*	17.8	100.0
85	73	Planning Research Corp.	318.0	135.6	138.4	−2.0	42.6
86	76	Lear Siegler Inc.	1,527.4	130.0	128.0*	1.5	8.5
87	82	Bradford National Corp.	144.4	127.4	115.4*	10.3	88.2
88	80	National Data Corp.	127.0	127.0	120.3	5.5	100.0
89	83	Recognition Equipment	117.0	117.0	112.4*	4.0	100.0
90	97	Micom Systems Inc.	113.7	113.7	78.0	45.7	100.0
91		Compaq Computer Corp.	111.2	111.2	NA	NM	100.0
92		Canada Systems Group	109.5	109.5	99.8	9.7	100.0
93	85	Commerce Clearing House Inc.	378.8	109.2	104.5	4.4	28.8
94		Cullinet Software	108.0	108.0	63.6	69.8	100.0
95	99	Schlumberger Ltd.	5,797.5	108.0	76.2	41.7	1.8
96		Docutel/Olivetti Corp.	215.0	105.0	90.0	16.6	48.8
97	100	Decision Data Computer Corp.	103.8	103.8	74.3	39.7	100.0
98	98	Printronix Inc.	101.3	101.3	77.4	30.8	100.0
99	91	Floating Point Systems	100.2	100.2	89.0	12.5	100.0
100		Mead Corp.	2,366.6	94.5	66.2	42.7	4.0

Ranking is by dp revenue in millions of dollars. *Restated figure NA: not available NM: not meaningful

1983 EMPL	1982 EMPL	DP REV PER EMP (DOLLARS)	R & D		NET INCOME	RETURN ON ASSETS	% DP REV FROM FOREIGN SOURCES	FISCAL YEAR END
			1983 ($ MILLIONS)	% OF TOT REV				
14,372	14,100	15.6	80	7.5	51.8	5.8	NA	Dec.
4,006	2,920	56.1	NA	NA	8.4	6.8	NA	June
3,923	3,933	56.5	14	4.6	33.8	NA	13.0	March
2,100	339*	105.2	5	2.5	29.6	15.8	NA	Dec.
2,400	1,825	87.8	17	8.3	27.3	NA	NA	Dec.
NA	22,000	NA	38	4.3	52.0	6.4	NA	Feb.
3,500	3,072	59.7	19	9.3	3.7	1.4	NA	Dec.
3,000	3,000	66.6	NA	NA	4,186.0	6.6	NA	Dec.
9,508	8,739	21.0	26	4.0	NA	NA	NA	Dec.
NA	1,632	NA	NA	NA	NA	NA	NA	Dec.
9,394	7,859	21.2	24	3.8	42.6	9.1	NA	Dec.
2,822	2,600	70.1	7	3.7	8.5	5.9	9.5	Dec.
1,636	1,458	117.4	9	4.6	17.2	NA	NA	June
26,361	25,681	7.0	84	5.1	167.4	14.1	10.0	Dec.
NA	2,900	NA	35.0	19.0	48.9	20.0	NA	Oct.
NA	NA	NA	142	12.6	116.1	6.9	NA	Dec.
22,154	21,698	7.8	NA	NA	172.4	4.0	NA	Dec.
1,551	1,352	109.4	25	15.0	26.1	9.3	NA	Dec.
867	491	194.5	6	4.0	22.4	12.4	NA	Oct.
NA	1,200	NA	NA	NA	NA	NA	NA	Dec.
1,700	2,000	96.5	11.7	7.0	-7.7	NA	NA	Dec.
1,000	450	163.5	16.4	10.0	14.9	17.3	NA	Dec.
5,824	6,051	27.4	8	1.9	49.1	18.5	NA	Dec.
55,000	42,600	2.9	443	7.2	103.0	1.9	NA	Dec.
1,500	1,300	106.0	8	5.5	11.3	9.1	NA	April
42,000	40,900	3.6	95	2.4	141.3	4.9	40.0	Dec.
1,425	1,164	107.9	10	7.0	23.9	NA	NA	Dec.
1,875	1,850	81.6	9	6.4	0.2	NA	NA	Dec.
117,750	44,337	1.2	394	3.9	98.0	1.2	32.0	Dec.
2,840	1,790	51.7	11	7.8	15.0	13.2	15.0	July
1,866	1,348	77.8	28	19.9	10.8	6.7	21.0	Dec.
3,365	3,349	43.0	7	2.9	13.8	9.4	NA	Sept.
1,700	1,700	83.0	NA	NA	NA	NA	NA	Dec.
1,665	1,096	84.5	NA	NA	3.5	2.1	NA	June
5,600	6,200	24.2	NA	NA	11.3	7.1	NA	June
20,000	22,000	6.5	30	2.0	73.4	8.2	NA	June
NA	3,000	NA	NA	NA	0.4	NA	NA	Dec.
2,253	2,458	56.3	2	1.7	11.3	12.0	2.1	May
1,944	1,924	60.1	6	5.4	9.6	NA	NA	Oct.
1,559	915	72.9	10	9.0	18.3	26.1	23.2	March
614	96	181.1	NA	NA	4.7	NA	NA	Dec.
NA	NA	NA	NA	NA	0.8	NA	NA	Dec.
5,654	5,300	19.3	NA	NA	24.9	8.2	NA	Dec.
1,050	706	102.8	10	9.6	15.3	NA	NA	Dec.
NA	NA	NA	NA	NA	1,084.3	13.8	NA	Dec.
NA	NA	NA	6	2.7	-14.0	-58.3	NA	Dec.
1,160	1,100	89.4	5	4.9	5.4	NA	NA	Nov.
1,320	1,097	76.7	4	4.1	6.9	10.9	13.0	March
1,319	1,390	75.9	12	12.2	13.1	NA	NA	Oct.
1,040	700	90.8	NA	NA	30.0	5.5	NA	Dec.

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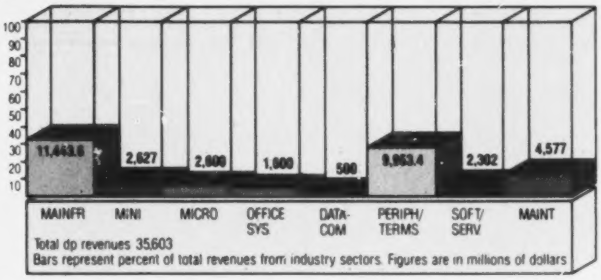

Total dp revenues 35,603
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

INTERNATIONAL BUSINESS MACHINES

Old Orchard Road
Armonk, NY 10504
(914) 765-1900

IBM rode the recovery to yet another record year in 1983, this time with corporate revenues topping the $40 billion mark. Once again Big Blue was the most profitable manufacturer in the country, with net earnings up 24% to $5.5 billion. Because IBM does not report specific product revenues, the overall dp and product category revenues listed here represent DATAMATION estimates. In 1983, dp revenues rose 22%, to $35.6 billion from $29.3 billion, with most business segments performing well.

It was one of the most eventful years in IBM's history. In February, chief executive officer John Opel succeeded Frank Cary as chairman of the board, and his influence was immediately felt. IBM pursued new and existing markets with vigor, continued its push to become the preeminent low-cost producer, chased some competitors in court, and embarked on ventures it had never before tried.

The company introduced several new processors during the year, beginning with the long-awaited System/36 in May. That machine replaced the most widely installed computer in IBM's history (PCs excepted), the System/34. IBM also brought out two high-end models of the 4300 mainframe line and new models in the System/38 and Series/1 lines.

But the most attention was paid to a rash of new products introduced in the PC line, which in January consisted of only one model. First came the PC XT, which was announced in March. That was followed by products that allowed 3270 terminals to act as PCs and vice versa, and in October, by the 3270 PC and the PC XT/370. Finally, in November, IBM admitted to the worst-kept secret of the year, the PCjr.

IBM also introduced the 5080 color graphics system, the Database 2 mainframe DBMS, several printers, the 4730 personal banking ATM, and the 7540 manufacturing system. The year also saw the first deliveries of two major IBM products, the 3084 top-end mainframe and the MVS/XA operating system.

IBM also came closer to its goal of being the industry's low-cost supplier. While revenues increased 17% and income 24%, the payroll grew only 1.4%, indicating IBM was able to earn significantly more money per employee than in the past.

When it wasn't premiering new products, IBM was suing competitors such as Hitachi and National Advanced Systems on a variety of trade secrecy charges. Both companies eventually relented under the pressure of IBM's lawyers.

IBM also got under the skins of Intel and Rolm, but in a more positive vein. The company acquired substantial chunks of both Silicon Valley firms, the first such investments in IBM's history. At year-end, IBM owned close to 20% of each firm.

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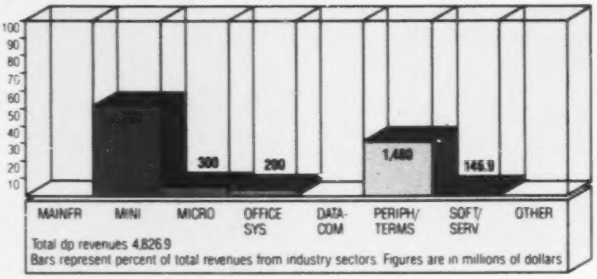

Total dp revenues 4,826.9
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

DIGITAL EQUIPMENT CORP.

146 Main St.
Maynard, MA 01754
(617) 897-5111

Calendar 1983 was a bad year for DEC, even though revenues climbed a respectable 20% to $4.8 billion. Earnings fell dramatically in the third quarter, dropping net income for the year 24.5% to $262.1 million from $347 million in 1982. DEC's management received low marks for its handling of the bad news; it had told security analysts in September to expect a strong quarter, only to report a few weeks later that the quarter's earnings were off 72%. "This doesn't speak well for their internal control system," Ulric Weil of Morgan Stanley commented at the time of the announcement.

Two factors were primarily responsible for Digital's breakdown. First, the company decided in the spring to cancel the Jupiter upgrade to the DECsystem 10 and 20 mainframes. Jupiter, which would have used ECL circuitry to run at 2.5 to 3 MIPS, had cost some $50 million at the time it was canceled. DEC set up a clearinghouse at the Marlboro, Mass., plant where the DECsystems were manufactured, so that users could help each other migrate to the VAX line of superminicomputers.

The VAX line, however, was the second major cause of DEC's earnings tumble. The high-end VAX-11/780 has been on the market for close to seven years, and products from IBM, Data General, and Prime have all eclipsed the 780 in processing power. DEC's upgrade, the 11/785, was finally announced this past April, three years late. Moreover, the Venus project, which will provide a processor to top off the VAX line later this year, was also delayed during 1983. Digital had its problems in the peripherals area too, because it encountered production difficulties related to its new disk drive.

In response, DEC moved forcefully on one front, changing its management style away from the separate product groups and into a more cohesive organization. Even as it was doing so, however, it was hemorrhaging vice presidents. By the end of the year, half a dozen senior executives had left DEC for other Massachusetts firms. Perhaps the loss that hurt the most was that of C. Gordon Bell, DEC's chief engineer and the architect of much of DEC's computer systems product lines.

Despite the problems, Digital had a few occasions to celebrate in 1983. It introduced two new machines for the low end of the VAX line, the 725 and the MicroVAX1—the first VAX on a chip. In addition, the company introduced the VAXclusters concept to enable users to form networks of closely connected VAX machines. DEC also announced that, after Venus debuts at the high end, a new low-end machine dubbed the MicroVAX2 would follow by year-end.

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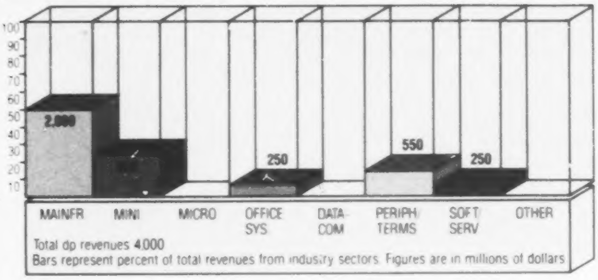

Total dp revenues 4,000
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars.

BURROUGHS CORP.

Burroughs Place
Detroit, MI 48232
(313) 972-7000

They're playing a new song in this part of the Motor City. Burroughs no longer wants to be known as a run-of-the-mill manufacturer of hardware and software. In 1983 the company announced its transformation to a total service organization that would be "second to none" in its commitment to service.

Burroughs may indeed have kept its word, although it finished second to a few in 1983. It was a slow first nine months, but fourth quarter orders 25% above those of 1982 changed the agony to ecstasy.

Overall revenue increased 5% to $4.39 billion. Net income jumped 67% to $196.9 million. The comparisons are skewed by a fiscal year change and significant write-offs at the end of the 1982 calendar, but they still tell a good story.

Possibly more important from the company's standpoint, Burroughs was very active in new products and developments. The company put its money where its mouth was by increasing its R&D budget a healthy 13%.

Foremost among the new products was the A9 series of mainframes. It comes in B, D, and F models, ranging from 1.2 to 2.5 MIPS. It's officially designed to replace the B6900 series and unofficially aimed at countering the new IBM 4361 and 4381 models introduced last fall. Delivery on the F model began in the second quarter; the other two will be available in the first quarter of 1985.

Other new products included the ET1100 and ET2000 electronic workstations, the B95 addition to the B90 family, the B1990 small system, and the B2925 midrange system.

These new offerings were nevertheless mere precursors to the expected introduction of the intelligent workstation, the B25, which one security analyst called "a critical ingredient in Burroughs' 1984 performance." Burroughs has big plans for this machine, the successor to the unspectacular B20 and also bought from Convergent Technologies. The company is bypassing direct distributors, preferring to go through independent dealers. To show it means business, Burroughs plans to increase that force from 200 to 700.

A joint venture was formed with Telex Computer to investigate gas plasma display technology. Graphics Technology Corporation (Graftek), a CAD/CAM manufacturer and distributor, was acquired in February. In addition, U.S. and international sales were brought together for the first time under Worldwide Marketing, an international advisory board.

Burroughs has undergone many such transformations in the last three years, causing much management turmoil. The year 1984 should determine whether the latest will be the last.

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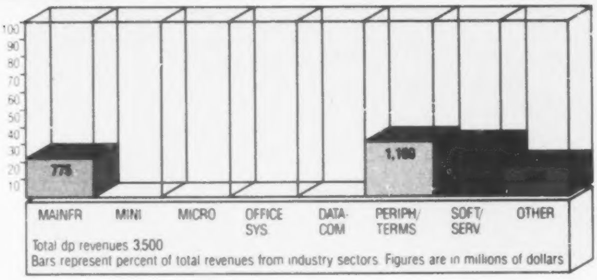

Total dp revenues 3,500
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars.

CONTROL DATA CORP.

8100 34th Ave. S
Minneapolis, MN 55420
(612) 853-8100

Control Data continues to set itself off from the rest of the BUNCH by concentrating on supercomputers, peripherals, and services. Indeed, less than 20% of its business currently competes directly with IBM, and that has enabled the company to withstand both the recession and IBM's more competitive posture. As a result, corporate revenues continued their climb, growing 5.5% to $4.58 billion in 1983, while net income increased 4% to $161.7 million. Dp revenue increased 6% to $3.5 billion.

Although CDC is often considered a mainframer, its largest businesses are peripherals and services. The peripherals segment, which sells a wide range of disk and tape drives that are compatible to IBM equipment, remained flat at $1.1 billion in 1983, but it introduced several products at the low end that are expected to have an impact in 1984 and beyond. Control Data is so far the only major supplier with a foot in the sub-5¼-inch disk drive market, which it entered in May 1983 with the Cricket series of 3½-inch floppy disk drives. And while the high-end 33800 IBM-compatible thin film disk drive did not contribute to revenues in 1983, it should reach volume production this year. Even though IBM has had a year-long jump on the 33800-compatible market, analysts expect that Control Data should be able to ship 800 to 1,000 of the 33800s in 1984.

Control Data is also the largest remote computing services company in the world, chalking up a solid 11% gain in revenue, to $1 billion in 1983. The processing services revenues are divided among the Business Information Services division, the Cybernet scientific and engineering services offerings, and the PLATO educational service. In the fourth quarter of 1983, PLATO finally achieved profitability, and the company expects that it will become a major contributor to the company's earnings in the future. More than 12,000 hours of courseware are available.

Control Data's CYBER series of supercomputers continues to battle crosstown-rival Cray Research in the upper echelons of MIPSdom. The CYBER 205 and 170 lines grew at a 10% clip in 1983, reaching $775 million in revenues.

The company cut back its R&D expenses severely in 1983, a 17% drop to $270.7 million, but it increased its stake in two cooperative ventures. The Microelectronics and Computer Technology consortium—which William C. Norris, Control Data's chief executive, founded in late 1982—established a permanent headquarters and staffed seven major research projects during 1983. The Semiconductor Research Corp. funded 47 grants to 32 universities covering basic technology fields in 1983.

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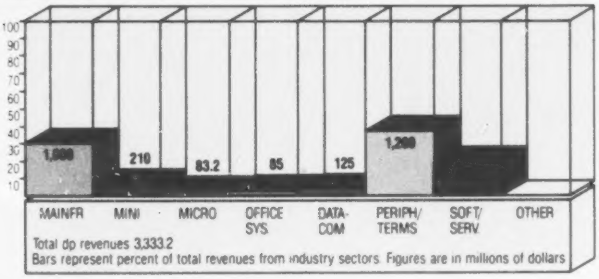

Total dp revenues 3,333.2
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

NCR CORP.

1700 South Patterson Blvd.
Dayton, OH 45479
(513) 445-5000

NCR celebrates its 100th anniversary this year. It should be one hell of a party.

The company finished its 99th year by setting records in revenue and net income: revenue increased 6% to $3.73 billion; net income rose an impressive 23% to $287.6 million.

So while many of its competitors struggled through 1983, NCR reaped the benefits of an expanded product line and strong order gains, particularly in the retail sector. This reflected the favorable reception given to NCR's new products, ranging all the way from micros to the initial models on its new 9300 mainframe line. Stringent cost controls, imposed early in 1980, also were a signifcant factor in contributing to what one Wall Street analyst called "an eminently successful year."

Things could get even better in 1984. NCR plans to further enhance its product line, which increased significantly in 1983. Several peripherals, productivity tools, and utilities transformed the Tower 1632 dp unit, released in late 1982 to oem markets, into a fully featured end-user system. NCR and Intel announced a new midrange, local area network called Mirlan. That was followed by the addition of seven new models to NCR's V-8600 family of large-scale computers. The company also entered the burgeoning telecommunications market by forming NCR Telecommunications Services Inc.

The company picked up in 1984 where it left off in 1983. A flurry of new products was highlighted by the NCR 7950, a general purpose clustered terminal system designed to be plug-compatible with the IBM 3270 operating in a communications intensive SNA/SDLC environment, and the NCR 5310 and 5320, a computer output microfilm system controlled by a personal computer.

NCR and Honeywell agreed that Honeywell will use NCR's 32-bit VLSI processor chip in the development of a future small- to medium-scale computer system. The companies will also jointly develop a custom chip.

"NCR beqins 1984 in the strongest financial position in recent company history," declares president and ceo Charles Exley, who assumed those offices in April 1983 upon William Anderson's retirement. "We are very optimistic about our future prospects."

They have every reason to be.

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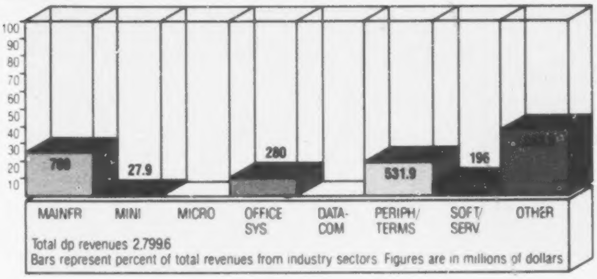

Total dp revenues 2,799.6
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

SPERRY CORP.

1290 Avenue of the Americas
New York, NY 10104
(212) 484-4444

Sperry came close to reversing its long slide during 1983, recording a slight drop in most areas but a hefty 29% jump in net income, to $176.7 million from $137.2 million. Corporate revenues declined just over 1%, to $4.75 billion from $4.8 billion. Dp revenue, which represents slightly less than 60% of the company's business, also dropped 1%, to $2.79 billion from $2.80 billion. On the expense side, R&D funding increased 1% to $296.4 million from $293.5 million—about 10.5% of dp revenues in both years. Sperry also paid off a large chunk of its corporate debt, which improved its financial picture (1982 revenues have been restated in light of an accounting change made last year).

Sperry's performance was bolstered by two major government contracts. On Jan. 27, it bested Burroughs to snag a $476 million, eight-year contract with the U.S. Air Force. The contract—the largest dp contract in history—calls for Sperry to install 153 of its midline 1100/60 mainframes and more than 20,000 terminals at all major Air Force bases around the world. Then, on May 30, Sperry beat IBM for the right to supply the Navy with a new generation of shipboard combat computers. That deal, which calls for 770 AN/UYK-43 computers and 300 spares, is worth $433.2 million to Sperry over five years.

Despite those two contracts, Sperry's mainframe revenues continued to decline during 1983, slumping 4% to $700 million from $728 million, as the company's user base continued to erode. Revenues from minicomputers and peripherals were flat over the year, and software revenues dropped 22% to $196 million. Nonetheless, the Mapper application development software prospered, surprising Sperry executives who did not want to sell it.

On the positive side, maintenance and repair revenues were up slightly over 1982, and office systems revenues grew a healthy 11%, largely because of the early success of the Sperrylink office automation system introduced late in 1982. Other dp product revenues, mainly defense related, improved 6% to $475.9 million.

While the Sperrylink, Mapper, and 1100/90 products began making their ways into user installations, Sperry continued to introduce new products. Substantially behind all of its major competitors, Sperry introduced its first personal computer in November, a modification of a Mitsubishi pc that is also being marketed by Leading Edge. Sperry said that the pc is being sold primarily to its mainframe user base.

Sperry's dp operations were renamed the Computer Systems Division in the spring, dropping the venerable Univac name.

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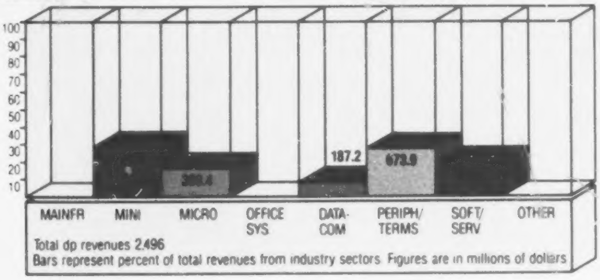

Total dp revenues 2,496
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

HEWLETT-PACKARD

3000 Hanover St.
Palo Alto, CA 94304
(415) 857-1501

If its competitors had this kind of a year, they'd be dancing in the streets. At Hewlett-Packard, they just go about their business.

The world's second largest minicomputer maker went about it pretty well, thanks. Corporate revenues increased 12% to $4.86 billion. Dp revenues did slightly better, jumping 12.5%. So did all the components, led by micro sales, which leaped 54.8%. Net earnings were ahead 13%, to $432 million.

Orders were up 18%, resulting in a $1.01 billion backlog at the end of 1983, compared to $768 million in 1982; third and fourth quarter orders showed the best year-to-year gains since 1980. All four of the company's business segments reported increased business. Total employment rose by about 4,000. And research and development increased 14.4% to $494.5 million, matching HP's goal of 10% of sales.

So what's so bad about feeling good? Well, '83 didn't quite match '82, when HP's revenue swelled 17.3% and earnings soared 25%. The company also continued to have troubles overseas, where a strong dollar led to HP's U.S.-manufactured products being less competitive in non-U.S. markets.

Speaking of U.S.-manufactured products, HP stepped full force into the volatile personal computer market with the HP 150. All users have to do is touch the screen, and their wish is the 150's command. To support this market entry, the company plans to triple its 450 retail outlets and has launched a $10 million television advertising campaign.

In another significant move, HP and AT&T Information Systems (ATTIS) completed joint certification testing of the HP 3000 business computer, the HP 150, and HP data workstations to use with ATTIS' Dimension System 85. This represented part of HP's effort to offer the industry's most comprehensive interconnect services.

HP was equally active with overseas firms, forming what president John Young termed a "very significant" joint venture with Samsung Electronics Company of Korea to manufacture computer products and sell and support HP products in Korea. HP also increased its stake in a Japanese joint venture to 75% from 49% by buying more than $35 million of new stock in the company, Yokogawa-Hewlett-Packard Ltd. of Tokyo. Trying to prove good things come in threes, HP entered into a joint venture with Genetech Inc. to develop instruments and systems for use by biotechnology industries.

Management indicated it was approaching the first half of 1984 "with caution," but was "optimistic" about prospects for the year. Odds are it's understating the case.

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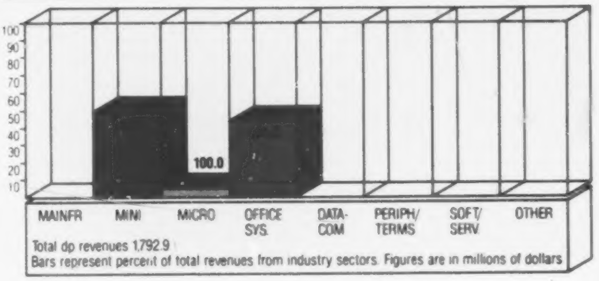

Total dp revenues 1,792.9
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

WANG LABORATORIES, INC.

1 Industrial Avenue
Lowell, MA 01851
(617) 459-5000

Dr. An Wang's prescription for success continued to pay off in 1983. The company's vital signs are good, but not great. Total corporate revenues, which leapt by 31% in 1982 and 48% the year before, grew by 26% in 1983 to almost $1.8 billion.

One Wall Street firm, recommending Wang as a company that "will move well ahead of the overall market," predicts the company will post annual earnings increases of about 30% through the rest of the middecade. Wang has set $5 billion as its target for 1990 revenues, and analysts seem to think a bull's-eye quite probable.

But year-end reports showed that while revenues were up, the strength of the dollar and competitive pricing had hurt the level of Wang's profits. For example, pretax profits for the fourth quarter of '83 (12.1%) were off slightly from fourth quarter '82 (12.6%). Still, these figures are higher than those for the rest of the minicomputer/office automation vendors—operating margins for the industry averaged 10.1% for the year.

In October, Wang held a press conference to announce what one observer called "everything but the kitchen sink. And if you could attach a kitchen sink to a personal computer, they would have announced that too." Some of the announcements revealed that a strategic shift had taken place at Wang.

Wang's Information Distribution System is a family of software products that provide a pathway to support services and applications between Wang VS systems and IBM or IBM plug-compatible hosts over an IBM 3270/SNA or BSC network. Wang admitted the announcement was equal to a de facto surrender to IBM standards. IDS is a first step toward an open architecture, says John F. Cunningham, Wang's chief operating officer. The significance of IDS "lies in the fact that most large companies have equipment from a number of vendors." So IDS will support IBM, UNIX, DEC, and X.25 protocols.

IDS did not mark a complete surrender, however; proud of its eminence in word processing, the text and document standards under the IDS umbrella are Wang's own.

Announced at the same time was Wang Office, a set of mail, directory, time management, and file management services; PACE, a fourth generation database management system; WP Plus, an enhanced word processing system; a clustered personal computer network; and PIC.

PIC, the Professional Image Computer, is based on Wang's Professional Computer. The desktop-sized PIC will scan images and digitize them for manipulation by the user.

Wang's pc continued to poke along, having sold only about 75,000 units since it was introduced. And one observer notes that what sales were made came at the expense of Wang's own word processing and minicomputer systems.

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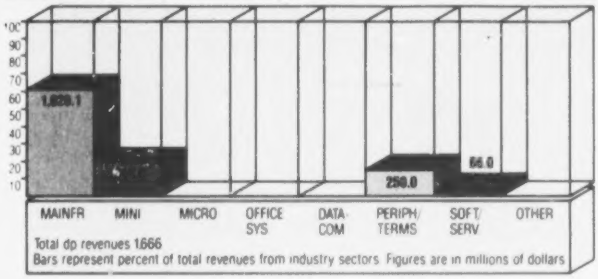

Total dp revenues 1,666
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

HONEYWELL INC.

Honeywell Plaza
P.O. Box 524
Minneapolis, MN 55440
(612) 870-5200

Honeywell started 1983 as if it were still hung over from 1982, which was not a very good year.

Overall revenue was up 4.8% to $5.8 billion from $5.5 billion. Ordinarily that means a good year, but not for Honeywell this time. Net income, the only number that matters, dropped 15.3% to $231.2 million from $272.9 million.

Most of that decline occured in Synertek, the company's semiconductor operation. Synertek's orders improved significantly in the fourth quarter, but its dependence on the electronic games business, particularly Atari, kept it in the red.

The good news was that Honeywell Information Systems (HIS), which accounts for more than 30% of Honeywell's revenues, showed its strongest signs of life since 1980. In 1981–82, more than 2,500 employees were released by HIS. That cost-cutting measure and a sharp increase in orders in the second half of 1983 yielded a hefty 63.7% increase in profits, to $131 million from $80 million, even though revenue decreased to $1.67 billion from $1.69 billion. The performance was an impressive comeback from 1982, when HIS revenues fell 50%. The situation is expected to further improve this year, as HIS struggles happily with a large order backlog. Volume shipments of DPS 88 systems should also contribute to revenue growth.

Honeywell was active on the products front, adding several new items to the low end of the line. The microSystem 6/10 is designed to be an end point in a larger network. The microSystem 6/20 provides for a cluster of up to four stations. The DPS 6/40 can handle as many as 28 stations.

The most significant new product comes not from Minneapolis but Japan. Like most of the BUNCH, Honeywell is having a rough time in the mainframe seas. It abandoned at least part of the ship by announcing it will buy some of its mainframes from NEC of Japan, marketed under the Honeywell label. If all goes well, Honeywell may produce the machines itself. The two companies will also jointly develop future large-scale products.

Ironically, NEC was an original licensee of Honeywell's technology, using that license to enter the computer market. Now it's helping its benefactor. Honeywell also teamed up with NCR to develop a custom integrated circuit chip for small- to medium-scale systems. All parties involved are hopeful these ventures will be mutually beneficial.

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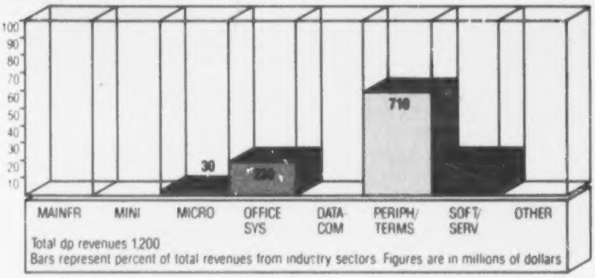

Total dp revenues 1,200
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

XEROX CORP.

P.O. Box 1600
Stamford, CT 06904
(203) 329-8700

Xerox has yet to duplicate its original success in the copier business. When the copier king lost the crown and, alas, some revenue it began to search around for new realms of opportunity. The office automation kingdom was a natural choice—but so far, not a profitable one.

Xerox's OA and copier operations have indeed become a drain on the company's resources, but those resources are still quite considerable. Xerox reports its dp revenue in 1983 nudged up slightly to $1.2 billion; corporate revenues were flat, at $8.5 billion. Corporate net income increased 27% to $466 million, but the company's profit margin of 5.5% lagged past performance and industry averages.

There were no spectacular increases on the data processing front either. DATAMATION estimates the biggest gains were scored in the office systems category, where revenues reached $230 million, up 15% from the year before. At the opposite extreme were terminals and peripherals, which fell off 6% to $780 million. Micros also remained static at $30 million and software and services inched up only 1% to $260 million.

Xerox had a relatively poor showing in the peripherals arena. It still hasn't managed to get the most out of such peripherals subsidiaries as Shugart Associates, Versatec, Century Data Systems, and Diablo. Indeed, the sale of printer products was way down last year, say industry insiders. One estimate is a $50 million pretax loss in the disk drive business. One bright note was the 200 series printer, which is doing very well.

Xerox must find customers for its office automation wares. Strong on the technology side, the company can't seem to translate that strength into earnings. Early this year it came out with two new 8010 Star workstations designed to broaden its customer appeal in the fiercely competitive OA market. One is a standalone system priced at $9,995 and the other is a remote workstation selling for $8,995. Xerox also slashed the price of the 8010 Star Ethernet workstation by 34% to $15,055. The company hopes the price cut will help pick up sagging sales.

Last June, Xerox formed a "corporate office" that includes three of its top executives. The triumverate consists of president and ceo David Kearns, chairman C. Peter McColough, and William Glavin, president of Xerox's business equipment groups. Glavin's elevation to this elite corporate circle indicates that Xerox is serious about its office efforts, but it doesn't look as if the turnaround, expected for the last few years, is in the cards in 1984 either.

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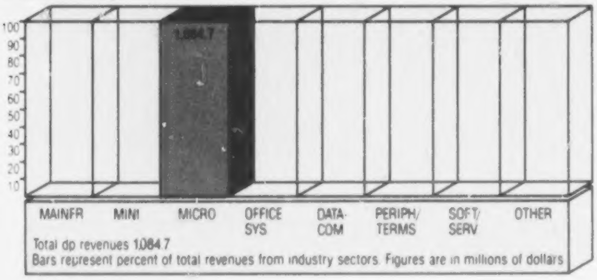

APPLE COMPUTER INC.

10260 Bandley Drive
Cupertino, CA 95014
(408) 973-3145

Growing up is hard to do, and 1983 was a very difficult year for Apple. The goal for 1983 was to crack the IBM-dominated office market in a big way with Lisa, its $10,000 pc. The results are in, and Apple failed. In the process it lost its dominance of the pc market and posted a 17% decline in earnings. On the brighter side, Apple's Macintosh was introduced to mostly raves and may reverse a depressing 1983.

While 1983 revenues were impressive—a 63% increase to $1.08 billion—earnings began falling in the September quarter and fell even faster by December. For the calendar year, earnings were $59 million, down 17% from 1982.

The strategy for Lisa was simple, sell to the Fortune 1,000 companies. These customers were less than enchanted with Lisa's price/performance, however, as well as with Lisa's inability to connect with their dp departments. By September, Apple revised its plans, and started pushing Lisa without its software and at a substantially reduced price. The strategy, effected by Apple's new national sales force, not only failed to stimulate business, but upset the company's independent dealers. While Apple was struggling with its ill-suited product and poor marketing plan, IBM took over the market.

By November, newly appointed president John Scully from PepsiCo could see red ink. Reacting quickly, he developed, then announced, a long-term strategy. The main theme was a family of 32-bit micros marketed to smaller companies through the independent dealers. The next phase was to be a new 32-bit micro, which turned out to be Macintosh. Scully stressed the importance of building communication bridges for its computers to the IBM mainframe environment. In addition, he announced plans to introduce new products for the Apple IIe to take advantage of the installed base.

These plans seem more realistic than that of tackling the Fortune 1,000 with the untested Lisa. Early indications are that Macintosh is now the number one pc, thanks to Scully's carefully laid out marketing plan, which featured an intimidating tv commercial that prompted an enormous number of sales on the day Macintosh was released. To really do justice to many of the advanced third-party programs being written, larger memory and storage capacities are required. (In its first configuration, the Mac comes with only 128K memory and no hard disk storage.) Apparently, though, Apple is learning that the best route to profits is through keeping the customers happy, and that's what Mac seems to be doing.

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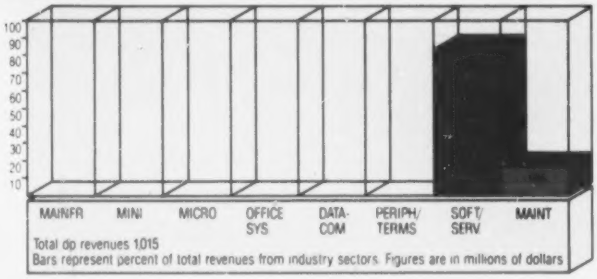

TRW INC.

23555 Euclid Ave.
Cleveland, OH 44117
(216) 383-2121

A company called TRW makes a lot of money—$5.49 billion in 1983—making a lot of things, and some of that money is made in dp. Last year, TRW's dp ventures produced revenues of $1.015 billion, most of it from services and software—$850 million—and the rest from third-party maintenance and repair—$165 million. These dp revenues were about 23% higher than those for 1982. Since TRW's overall revenues only improved by about 7% over the year before, dp was obviously one of the bright spots in this veteran conglomerate's portfolio of businesses.

People who imagine conglomerates to be recent phenomena should note that TRW began life in 1901 in Ohio as the Cleveland Cap Screw Company. And while TRW, like most conglomerates, is better known for acquiring companies, it is sometimes forced to shed them: last year TRW dropped out of the TRW-Fujitsu Co. (TFC), ceding most of this point-of-sale, bubble-memory-equipped terminal business to its partner in the onetime joint venture.

The company's biggest dp money-maker was its credit analysis operation. Running on IBM equipment, TRW maintains trade payment data that demonstrate the payment habits of nearly 8 million business locations from all industries. About 7,000 companies contribute automated and manual accounts receivable information to the database every 90 days. Last year, TRW boasted that its files contained "over 20 million lines of payment experiences."

The consumer credit part of the business maintains credit information on more that 90 million consumers, and supplies credit reports to 24,000 customers doing business at 35,000 sites. TRW says it can generate as many as 250,000 credit reports a day. (Management is said to view this U.S.-centered business's 12 inoperative hours a day as wasted profits, prime time for new business. There is talk that expansion of the service to customers in Europe and the Far East could mean a round-the-clock production cycle and round-the-clock profits. In 1983, 24% of the company's dp revenues came from abroad, down from the 28% that was posted in 1982.)

Last year was the middle year in TRW's five-year plan aimed at increasing software productivity. The company says the results have been promising: it claims that doubling productivity by 1985 and quadrupling it by 1990 are realistic aims.

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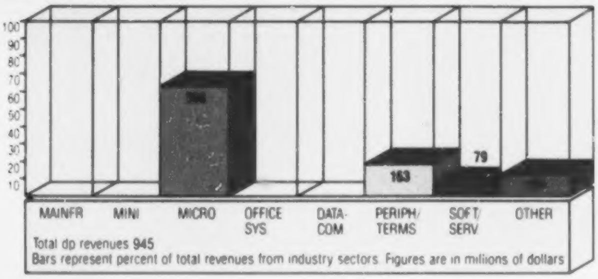

Total dp revenues 945
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

TANDY CORP.

1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3700

In the rough and tumble world of personal computers, Tandy was one company that did not gain ground during 1983. Its sales were up, but not as much as Commodore's, Apple's, or IBM's. Yet considering that Texas Instruments was falling by the wayside, Tandy's performance has to be considered good. Dp revenues were up 30% to $945 million from the $725 million posted in 1982. Corporate net income increased 24.2% to $278 million from the $222.4 million of 1982.

It seems that Tandy, like Apple, was suffering from IBMitis during 1983. Despite the natural advantage of its own retail outlet, with over 400 computer stores, Tandy's computer business was hurt by Big Blue. The new model 2000 was introduced in December, touted as being three times faster than the IBM PC and 25% cheaper. But few were available because of the shortage of its brain, the 80186 microprocessor from Intel.

The 2000, available in two versions, has a main memory expandable to 768K RAM. The basic system, with 128K of memory and including two disk drives for storing 1.4MB, is priced at $2,750; the version with a 10MB hard disk drive is $4,250. Tandy claims the 2000 can read information on disks created on the IBM PC.

Tandy claimed to have a product that was compatible with existing packaged software; however, the Intel 80186 chip limited the machine to relatively few such packages.

Tandy had high hopes for the 2000, aiming it at IBM's traditional office turf and Tandy's weakest market. The company was counting on the 2000 to improve its consumer toy image and to slow the ascent of the IBM PC as the de facto industry standard. A number of software companies had promised to produce software for the 2000 to give it the extra push needed to stop IBM's momentum. IBM, however, remained supreme, because Tandy's machine didn't quite deliver the goods.

Ironically, Tandy's portable machine, the model 100, was a big success during 1983; many buyers picked up the inexpensive lap model as a traveling notebook. But many other companies have entered this business. If Tandy hopes to be a competitor in dp, it must develop a marketing strategy to outwit Big Blue and add to its profits column in a big way.

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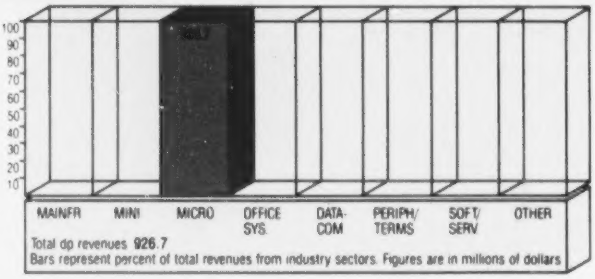

Total dp revenues 926.7
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

COMMODORE INTERNATIONAL LTD.

950 Rittenhouse Rd.
Norristown, PA 19403
(215) 666-7950

Commodore rode the crest of the micro wave to new heights in 1983. Corporate revenues increased 127% to $1.04 billion, up from $459.8 million in 1982. Earnings also skyrocketed 91.6% to $126.1 million, up from $65.8 million in 1982.

These gains were made while its major rivals were floundering in the price-cutting environment of 1983. Atari and Coleco were both having problems and losing money. Texas Instruments went for 10 rounds and then quit, a definite loser. Apple watched as its perfect earnings record went down the tubes. Commodore's success in the competitive year led one analyst to comment, "Commodore has out-Japanesed the Japanese."

Upon reaching the billion dollar sales mark, however, Commodore seemed to trip up. Founder and president Jake Tramiel abruptly resigned, and was quickly followed by four other top executives. The reason for Tramiel's departure was a disagreement with board chairman Irving Gould over a new executive hiree. The resignations sent tremors through Wall Street and the dp industry. As the dust settled, observers began commenting on Tramiel's well-known erratic management style and the furor seemed to die down. Analysts point out, however, that Commodore is poised for further expansion, and changes in the executive suite were not likely to derail the company.

During 1983, Commodore passed a number of milestones. One important one was in the software arena, in which Commodore has been weak. In June, the company introduced 70 software packages for its computers, all priced under $100. Among them were the new Magic Desk, which competes with Apple's Lisa and provides users with an integrated set of functions, including word processing and file updating. Analysts predict these products should generate $200 million in revenues in the next two years.

One well-known aspect of Commodore's success is its integrated manufacturing abilities and strategically placed plants. Another is its dedication to its independent dealers, as evidenced by the time Commodore, behind because of production problems, began overnight shipping at its own expense to get its product to its dealers. These dealers have paid Commodore back in loyalty. During 1983, a considerable number of new dealers were added to Commodore's network: K-Mart, Sears, and J.C. Penney have all agreed to carry the Commodore line.

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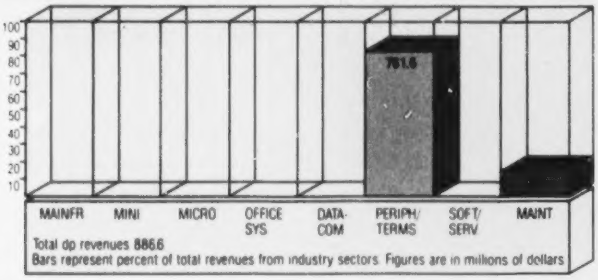

Total dp revenues 886.6
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

STORAGE TECHNOLOGY CORP.

2270 South 88th Street
Louisville, CO 80027
(303) 673-5151

Murphy's law is alive and well and living—nay, thriving—at Storage Technology Corp. Whatever could have gone wrong during 1983, with scant few exceptions, did go wrong, at the worst possible time and in the most embarrassing manner. The year was, in short, an epic disaster of titanic proportions.

The financial results only begin to tell the story. After over a decade of steeply rising revenues and profits, culminating in 1982 with $1.08 billion in revenues and net profits of $64.7 million, revenues shriveled to $886.6 million and profits evaporated completely. Net income totaled 3 cents per share in the first quarter, more than a 90% drop from the same period a year earlier. Then the picture got worse, with a profit of 1 cent per share in the second quarter and sizable losses—StorageTek's first ever—in the last two quarters. Over the year, the company lost $40.9 million.

The firm's fortunes in general throughout the year were even worse than the financial nosedive. The late 1982 field replacement of defective head-disk assemblies in the 8650 disk subsystem cost the company a pretty penny early in the year, and endless delays on the 8380 disk drive line kept costs mounting through the year. The large-scale disk subsystem did not begin shipping in volume until the late fall.

StorageTek had similar problems with both disk drive lines in 1982, but the firm's tape drive business was healthy enough to sustain the financial health of the company. In 1983, however, the tape business itself weakened, resulting in a $9.4 million loss from continuing operations.

The lion's share of StorageTek's financial woes, however, is due to the steep development costs of two new products, an optical disk drive capable of storing 4GB per platter and a midrange mainframe computer. The optical drive was one of 1983's only bright spots, since it was announced on time and within the $50 million budget raised by limited partners.

The mainframe project, though, was the most conspicuous of Storage Technology's many disasters during the year. It was designed to implement power and space-saving CMOS technology, but cost overruns and technical problems prevailed. StorageTek decided in January 1984 to cancel the cash draining project, resulting in an $18 million write-off.

And if StorageTek's product woes weren't sufficient, the executive offices of the company became something of a revolving door, with several top aides to chairman Jesse Aweida resigning. Nonetheless, many analysts believe that StorageTek—which changed its logo from STC early in 1984 to avoid a trademark infringement suit—will rebound in the next few years because it is currently at the beginning of several product life cycles, which will generate more revenue as they age.

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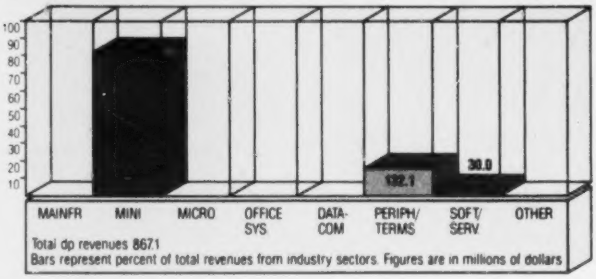

Total dp revenues 867.1
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

DATA GENERAL CORP.

4400 Computer Drive
Westboro, MA 01580
(617) 366-8911

This time, mighty Casey did not strike out. Instead, with his back against the wall after two bad years, Data General ceo Edson de Castro hit a grand slam home run. The company's revenues climbed 7.9% to $867.1 million; its net income leaped 125% to $29 million; its operating margins turned sharply upward after hitting bottom in the fourth quarter of 1982, reaching 10% early in 1984; and its stock price increased by 350% since August 1982. So there is indeed joy in Mudville, and in Westboro, and on Wall Street, for Data General has roared back to life.

The company's financial success marked a major turnaround, as Data General resumed the upward spiral it enjoyed through the first decade of its life. Yet the extent of the turnaround is only partly measured by the financial results. It is also apparent in the firm's ability to attract nine new officers to the company to complement company founders de Castro and executive vice president Herb Richman, and in its products. Data General completely updated its superminicomputer line in 1983, snaring the technological lead from archrival Digital Equipment.

The 32-bit Eclipse line, whose first member was introduced in 1980, three years after DEC created the market, was expanded at both ends with the top-end MV/10000 providing twice the power as the top-end DEC VAX-11/780 at about the same cost. The low end was extended with the MV/4000, and two MV/8000 models updated the midrange. The Eclipse MV line continues to account for the largest portion of Data General's revenues and is sold through both the oem oriented Technical Products division and the commercially oriented Information Products division.

Data General also introduced its second stab at the microcomputer market in 1983, the Desktop Generation line. The line ranges from a low-end model 10, comparable to many other pcs, to a high-end model 30 capable of running minicomputer applications. The systems can all run DG's AOS operating system, providing a family of completely integrated products from the low-end model 10 micro to the high-end MV/10000 supermini.

The firm was active on the software side as well, landing two of the largest software contracts in history. Both the U.S. Forest Service and E.F. Hutton signed multimillion dollar contracts to use the CEO line of office automation software. DG also combined with Rolm to offer one of the three certified Ada compilers currently available, and joined forces with both Northern Telecom and AT&T to offer computer-to-PBX connections.

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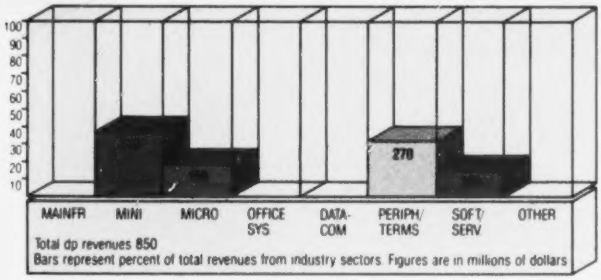

Total dp revenues 850
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

TEXAS INSTRUMENTS INC.

P.O. Box 22574
Dallas, TX 75265
(214) 995-3773

The Yellow Rose of Texas turned bright red last year. Texas Instruments did indeed have a lot to blush about in 1983, when it was forced to bolt the home computer business, saddling the company with a walloping $660 million pretax loss. Result: TI took to the debt trail, reporting a consolidated after-tax loss of $145.4 million compared with net income of $144 million.

TI's total corporate revenue inched up 6% to $4.58 billion. The company claims its 1983 dp revenues crawled up a mere 1% to $680 million after the pc fiasco. Most of the dp revenues stem from the minicomputer arena, which posted a 1% increase to $330 million. Terminals and printers contributed $260 million—down slightly from 1982.

Overall, 1983 was a year of sluggish sales and shipments for one of TI's more dynamic divisions. Contradicting this trend was the TI Professional Computer. Sales of the system, which is aimed at the business market, continued strong throughout the year, especially in the last quarter. TI's Business Systems series minicomputers didn't fare as well, reflecting the general trend in the industry. Nevertheless, sales of the mini began to pick up in the second half of 1983. The company itself admitted year-end results for its digital systems operation were depressed by new product development and marketing costs.

The digital products sector, however, was a veritable gold mine compared to TI's consumer electronics group. There were no happy trails, only tears for TI as it slashed the price of its ill-fated 99/4A home computer below $100. This drastic move didn't help earnings; sales of the system and its associated peripherals and software continued to drop last year, and operating losses continued to mount.

Then finally it happened. The eyes of Texas and the world were on TI as it gloomily announced its withdrawal from the home computer business on Nov. 1. Following that announcement the company summarily fired 1,000 employees at its Lubbock, Texas, plant, the home of TI's troublesome home computer. In abandoning this market, the company is also abandoning a concept that it can truly be successful in the consumer marketplace.

Helping to mitigate against this disheartening loss was good news on the semiconductor front. Like other semi manufacturers, TI was greatly helped in its semiconductor business by the overall market recovery. Decent sales were also reported by the company's defense electronics operation.

Having tossed out its earnings sponge—the home computer operation—the giant electronics company is now free to get on to more profitable business pursuits. Leading TI in that pursuit will be J. Fred Bucy, succeeding Mark Shepherd Jr., who retired as ceo.

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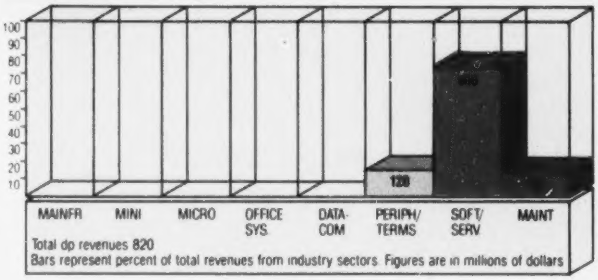

Total dp revenues 820
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

GENERAL ELECTRIC CO.

3135 Easton Turnpike
Fairfield, CT 06431
(203) 852-8200

Despite the economy's general improvement, General Electric continued to have difficulty in 1983. Revenues picked up 1% after a 3% drop in 1982, finishing at $26.8 billion on the year. Net income increased 11% to $2 billion from $1.8 billion in 1982. Even those modest increases were substantial compared to GE's dp business segments in 1983, however. Revenues from dp fell 5%, to $820 million from $862 million. And while the firm would not be specific, it did report that net income for the dp-related businesses was also sharply lower on the year.

By far, the largest portion of GE's dp business is the General Electric Information Services Co. (GEISCO) subsidiary, where 1983 revenues dropped 8.5% to $600 million, from $655 million in 1982. In large part, that drop reflects the general decline of the timesharing industry as in-house computing capabilities increase; it also reflects a change in GE's strategy. GEISCO's greatest source of revenue continues to be the Mark III teleprocessing network, the world's largest such commercial network, but GE is shifting its emphasis to distributed computing services provided by the network. This shift comes from GEISCO's attempt to tie personal computers into Mark III. In January, GEISCO became an IBM value-added dealer so it could sell its customers IBM PCs; it then enhanced Mark III to accommodate—and encourage—the use of pcs rather than terminals.

The results of that strategy shift are apparent in GE's 4% gain in peripherals revenues, to $120 million, as users began shifting to the high-ticket pcs rather than the cheaper terminals. The peripherals revenues were also aided by a micro-to-mainframe communications board sold by GEISCO's subsidiary, Software International Corp., which provides financial software products for both micros and mainframes. The Smart-Link hardware/software combination for linking pcs to central hosts was introduced in February.

General Electric also manufactures and sells the Calma line of CAD/CAM/CAE design equipment. Calma recorded an 8% gain in 1983, to $100 million, as the CAD/CAM industry continued to grow explosively. Calma broadened its electronic design software offerings by acquiring TEGAS Systems, a computer aided engineering software firm.

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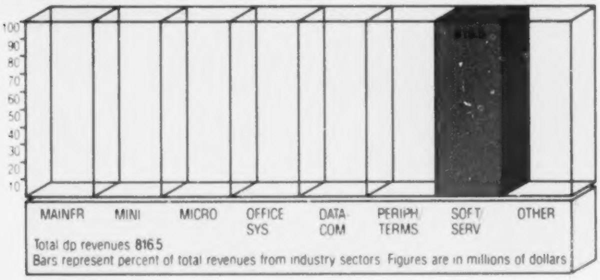

Total dp revenues 816.5
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

AUTOMATIC DATA PROCESSING INC.

One ADP Boulevard
Roseland, NJ 07068
(201) 994-5000

ADP is the only company in the industry to have produced its own U.S. senator, founder Frank Lautenberg. More impressive, however, ADP has achieved earnings and revenue growth of over 10% for each of the last 23 years, a record unmatched by any other company listed on the New York Stock Exchange.

Last year, the company's total revenues hit $816.5 million, up 15.9% over 1982. Net income rose by 14.5% to $68.7 million. At year's end, the corporate purse was plump: $52 million in cash was on hand.

Research and development costs hit $29.5 million last year, an increase of 18%. Some of this increase was due to the company's expansion of its brokerage services from the back office into the front office. Quotron, the longtime leader in front-office information distribution, is already said to be feeling the heat of ADP's foray into this market. Prudential-Bache is working with ADP on this project, but ADP will be free to market the service to the financial industry just six months after Prudential-Bache goes on-line.

ADP's acquisitions last year also demonstrated the important place brokerage services will play in its future: in June it bought Computer Information Service Inc. (CIS), and in August, GTE Telenet Information Services. CIS is a veteran supplier of back-office, record-keeping services to brokers and traders, and CIS delivers database and quotation services for the brokerage and investment community. ADP says these acquisitions will "accelerate" its development of an interactive workstation for sales, trading, and operational personnel in the securities industry.

About a third of ADP's income comes from its payroll business, an area that has recovered from the staff reductions with which many of its client industries responded to the recent recession: there are more customers and the average number of employees on each payroll has increased.

Electronic funds transfer is one area of ADP's business that still hasn't made any money. Losses of between $300,000 and $400,000 per month were common last year. But the company says it will stop losing money there by the end of 1984.

When the silver-haired, silver-tongued Lautenberg left for the marble pastures of D.C., there were some who feared for ADP. Better they should have bought stock.

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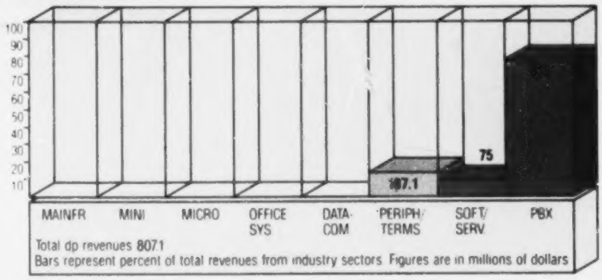

Total dp revenues 807.1
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

AMERICAN TELEPHONE & TELEGRAPH

550 Madison Ave.
New York, NY 10022
(212) 393-9800

What a difference a year makes. As the crowds milled in Times Square to ring in 1983, we still had Ma Bell to kick around. Twelve hours later, a multibillion dollar subsidiary called American Bell was weaned, and vice president Archie J. McGill introduced AT&T's first digital PBX. Six months later, McGill was gone. By the time the crowds milled in Times Square to ring out 1983, American Bell was gone too, and so was Ma Bell's venerated Bell System. In the end, the familiar names of Long Lines, Western Electric, Bell Laboratories, and Teletype had either been obliterated or obscured; we now have AT&T Communications, AT&T Technologies, AT&T Information Systems, AT&T Bell Laboratories, and AT&T Teletype. All of this left the accountants with the nightmarish task of sorting out Ma Bell's finances.

Those finances, as it turns out, were less than overwhelming. AT&T's 1983 corporate revenues came to $69.4 billion, a 7% rise from 1982, while 1982's $1.5 billion net income became 1983's $4.9 billion net loss. Early in 1984, AT&T ceo Charles Brown announced that for the first time in history AT&T's earnings could not cover its declared dividend, but it would be paid anyway. Future dividends were left in question.

The dp side was no better, with revenues outside AT&T gaining 1% to $807.1 million. Bell's revenues from the Unix operating system and a host of applications software packages were flat on the year at $75 million, and AT&T's PBX business picked up a mere 4%, to $625 million. DATAMATION estimates that upwards of 90% of that PBX business was for analog switches, with the System 85 voice/data digital switch pulling in the remainder.

The Teletype subsidiary's sales outside AT&T of terminals and data communications equipment fell 7% to $95.8 million, and its maintenance and repair revenues dropped 47% to $11.3 million. The drops are due more to an increased percentage of sales into the Bell System—to 71% in 1983 from 62% in 1982—than to weakness in the business. None of AT&T's approximately $600 million worth of 1983 sales of the 3B series of minicomputers were included in its dp revenues, because the hardware was sold exclusively into other parts of the massive company. Those sales will be included in 1984 because of the divestiture of the local operating companies—the largest users by far of the 3B line—and the March 1984 announcement that the line would be sold to others outside AT&T.

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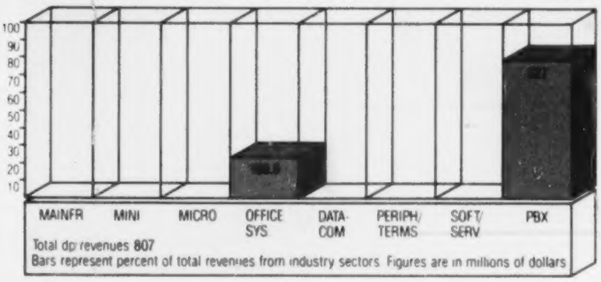

NORTHERN TELECOM INC.

259 Cumberland Bend
Nashville, TN 37228
(615) 256-5900

Northern Telecom's acute embarrassment in the computer industry finally ended last year. The Canadian telecommuncations hardware vendor bought several U.S. data processing companies in the late 1970s in the hopes of meshing their terminals and cpus with its PBXs and other gear and creating the office of the future available from one vendor. Instead, it lost key dp designers and marketers, customers, and money. In 1983, however, the hemorrhaging ended when the company announced that the last consolidation of its dp operations, into an Electronic Office Systems (EOS) group, led to break-even or marginally profitable operations at year-end.

Included in Northern's $1.9 billion in sales is about $180 million in terminals and other office hardware and $627 million in digital PBXs that switch voice and data communications; the rest of the revenues represent specialized switches for telephone companies. Corporate net income soared last year 93% to $268.4 million, in part due to the carrying forward of tax losses from prior years and the economies of scale in its PBX business, increased sales to the Bell operating companies, and the cauterizing of the losses at EOS. R&D funding was sharply boosted, to $324 million from $241 million in 1982, as the company continued its efforts to make its PBXs and other hardware compatible with dp equipment made by other firms.

This "open world" policy provided for bridges to hardware built by more successful dp players, such as Digital and Sperry. The company's PBXs now include optional cards for handling IBM PC transmissions and moving analog data to other areas of an organization without modems.

After shoring up the weaknesses in its EOS, the company began a new disk and tape drive venture in Ann Arbor, Mich., site of one of the companies folded into Northern six years ago. If the company is to meet its goals of increasing revenues and earnings by more than 25% this year, its ventures in the dp business must be more successful than in the past.

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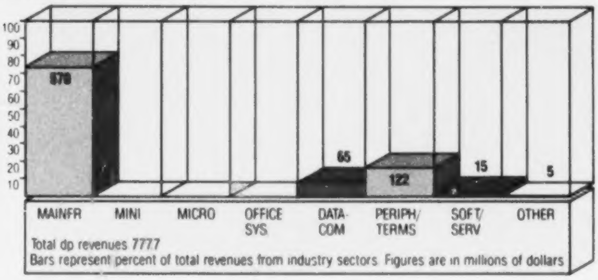

AMDAHL CORP.

1250 E. Arques Ave.
Sunnyvale, CA 94086
(408) 746-8510

Everything came together for Amdahl in 1983 as the company hit new highs in revenues and earnings. Revenues soared 68%, to $777.7 million, on the strength of demand for the Model 580 family of IBM plug-compatible mainframes. It was the earnings side, however, that showed the most improvement—net income up 621% to $46 million. Only $3.2 million of that was an extraordinary gain; the rest was real profit. Amdahl's earnings were very depressed in 1982 owing to production and reliability problems with its new large-scale processors. Once Amdahl solved these problems, it began to reap the benefits.

The uniprocessor 580 and its dual-processor siblings, the 58XX series, were subject to the usual combination of turbulence from IBM and skittishness from customers. A major reliability problem with the processors was resolved in what one observer called a mind-boggling troubleshooting effort.

By year-end the company had shipped about 200 processors, including the last of the old 470 systems. Estimates of 1984 processor shipments start at around 50% over the 1983 level, indicating that Amdahl may survive the short-term impact of price cutting announced by IBM late last year for its big machines.

Over the long term, the 10% or so price reductions for 308X series machines are expected to be a big challenge for Amdahl sales personnel, or at least until a new big processor box is introduced to reestablish the typical price/performance trade-off Amdahl has enjoyed in the past. Pressure on the company's order books for the new Sierra line from IBM will no doubt increase the suspense about whether the plug-compatibles have a promising future.

Wall Street analysts are particularly happy with Amdahl's success in the disk business. They estimate that Amdahl, which started with nothing in 1982, shipped close to $100 million worth of Fujitsu's Eagle disk drives during the year, and they expect the company's peripheral business to increase to $250 million to $300 million in 1984, partly because of rising sales of data communications gear.

There were rumors during 1983 of a possible AT&T-Amdahl marriage, but Fujitsu, which has owned 30% of Amdahl for years, recently upped its stake to 49.5%, putting an end to such rumors. The Fujitsu disk drive connection in 1983 showed just how profitable Amdahl could be. More technological exchanges are expected in the future.

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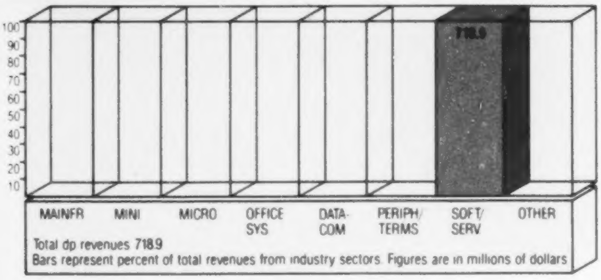

Total dp revenues 718.9
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

COMPUTER SCIENCES CORP.

650 N. Sepulveda Blvd.
El Segundo, CA 90240
(213) 615-0311

Computer Sciences slogged through an off year despite a 5% increase in revenues, to $718.9 million from $683.4 million. Net income was off nearly 20%, to $15.9 million from $19.7 million. Part of the problem was that the firm spent almost as much time in the courtroom as it did in the boardroom. It won a $1.5 million settlement against Itel Corp., but spent $4 million in a separate case, related to a completed contract with the U.S. General Services Adminstration for remote computing services. The company also suffered because of the continuing decline in the use of timesharing services experienced throughout the industry. CSC sold some accounting services in September to hasten its exit from the timesharing business.

Computer Sciences breaks its business into two segments, data services and contract services. The data services operation provides customers with remote dp services using proprietary packaged software and the Infonet timesharing network. Revenues in this area continue to climb slowly, but income has been evaporating, dropping from a pretax high of $24.8 million in fiscal 1980 to $6.8 million last year. Despite the fall, there were some bright spots for the data services operation. It completed the upgrade of its Sperry mainframes ahead of schedule, and boosted its IBM systems as well. Applications on the Infonet service include credit reporting, tax processing, payroll, accounting, and distribution management services.

The contract services operation picked up strongly in 1983 after a lackluster 1982. The operation provides custom-designed computer and communications systems, support of client technical activities, and management of client computer facilities. It also develops and markets turnkey systems for government customers. CSC was particularly strong in dealing with the Defense Department last year, securing several contracts for command and control, weapons systems, communications, simulation, training, logistics, and management coordination. CSC teamed with Sperry in 1983 to win the largest dp contract ever awarded, a $476 million pact with the Air Force.

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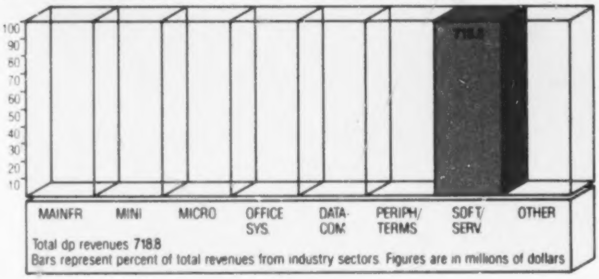

Total dp revenues 718.8
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

ELECTRONIC DATA SYSTEMS

771 Forest Lane
Dallas, TX 75234
(214) 661-6177

Apparently, last year EDS chairman Ross Perot engineered not a single international jailbreak. In 1983, the headlines earned by EDS were all on the business pages. Total corporate revenue rose from '82's $562.6 million to $718.8 million, up almost 28%. Net income rose by just a hair less, a little over 27%, from $53 million to $67.4 million. While things haven't been so wonderful for some companies in computer services, this firm has been growing steadily for almost a decade, and has paid its stockholders—Perot, the largest, holding 29% of the shares—handsome dividends since 1973.

A lot of EDS's new business in 1983 continued to come from contracts with local, state, and federal government agencies. In fiscal 1983, fully 24% of EDS's revenues came from deals with federal agencies. (EDS's $656 million deal with the U.S. Army, signed in 1982, is the largest single contract ever awarded in the computer services industry.) In October, for example, the U.S. Postal Service signed EDS to a seven-year, $200 million contract to support airmail. In addition, Medicare and Medicaid programs in Alabama, Colorado, Florida, Idaho, Mississippi, Tennessee, and Texas will use EDS facilities. EDS has deals with welfare agencies in Mississippi, New Jersey, and New York and will support New York City's Welfare Management System. Further government contracts were signed with the Departments of Interior, Energy, and Agriculture, the U.S. Navy, the U.S. Army, the National Institutes of Health, the Social Security Administration, and the Immigration and Naturalization Service. While "big government" is not politically popular, it has demonstrable charms for EDS salespeople.

Another big customer for EDS has been the nation's banking and thrift industry: during the third quarter of '83 alone, EDS signed contracts with 79 new credit unions, and added 22 banks and several existing customers to the user list of its Inform community banking service.

Among EDS's 1983 acquisitions were credit union processing companies in Virginia, Wisconsin, and Texas; the U.S.-based business of Datacrown, a Canadian teleprocessing service; and the data center operations of Computer Usage Corp.

One entry on EDS's balance sheet raised further memories of the company's involvement in Iran: in June, after two years of negotiations, EDS managed to collect a $16.5 million court judgment from the Khomeini government for work that had been done for the Shah's Social Security Organization.

Between new business and old, EDS has about $2.8 billion in confirmed orders on its books. Scheduled for delivery over the next few years, this business should ensure that EDS's annual revenue gains will continue to be robust.

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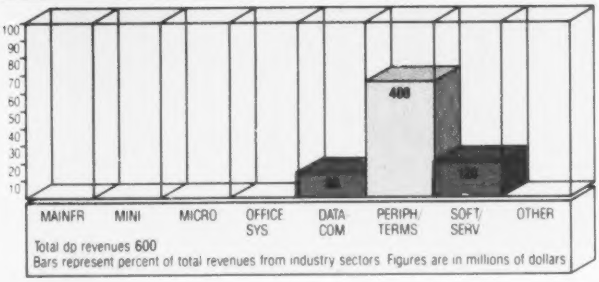

Total dp revenues 600
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

ITT CORP.

320 Park Ave.
New York, NY 10022
(212) 752-6000

An idle viewer of ITT's ubiquitous television commercials might assume it had invented everything up to and including sliced bread. But if it didn't invent everything, it certainly seems able to sell everything. Nestled among the other businesses of this largest of conglomerates was about $600 million in 1983 sales of dp and terminals, about 14% over its 1982 level. The dp upturn looks even better when viewed against a 4% drop in overall corporate revenues, down to just over $20 billion from $21 billion. Despite the downturn, profits were up 1.8% to $674.5 million, partly because the company continues to trim its huge staff, now hovering at just about 278,000.

(One very visible change at ITT in 1983 was its new name. The International Telephone and Telegraph Corp. dropped everything but the acronym by which it had been known for years, and ITT now stands for nothing more than ITT.)

Data communications accounted for a little over 13% of ITT's dp revenues last year, about $80 million, and this segment of ITT's business is expected to grow if access to its new packet switched network increases. Announced last summer, the network can now be used by customers in five cities, and while the company says more cities will be added by the end of 1984, the network has grown more slowly than expected.

Qume, the San Jose-based maker of printer and memory devices that ITT bought in 1978, is estimated to have about $200 million in revenues. But profits in this field are under intense competitive pressure: early this year, Qume announced its last domestic factory would close and manufacturing would move to existing plants in Taiwan and Puerto Rico.

ITT Courier Terminal Systems announced late in '83 it would be selling an IBM PC lookalike, the Xtra, with shipments to begin around tax time this year. Deliveries were delayed and the first machines should be reaching stores as you read this, priced just under IBM's machine. It's expected Xtra will do better in European markets where ITT's dealer network is strong and well established.

Whether or not Xtra adds much extra cash to ITT's bottom line, this year will probably mean increased sales for the company because of the AT&T breakup. With the regional Bell operating companies forced to seek hardware from sources other than Western Electric, ITT's new digital switch could add more customers. Southwestern Bell has already ordered $30 million worth of telephones from ITT. So the company that began decades ago when AT&T divested its foreign operations could do almost as well out of the current divestiture.

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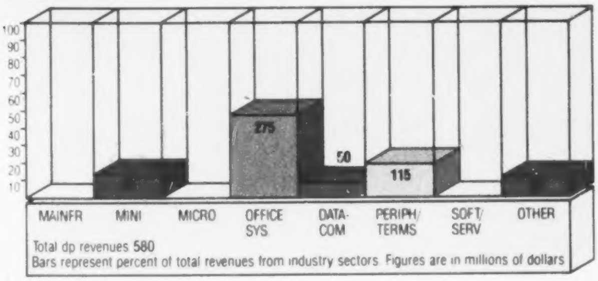

Total dp revenues 580
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

HARRIS CORP.

1025 W. NASA Blvd.
Melbourne, FL 32919
(305) 727-9100

The news from Harris headquarters is mixed. For calendar 1983, total corporate revenues increased 6.1% to $1.64 billion while net income dropped 6.4% to $68 million. These results, however, are difficult to compare because of the 1983 merger with Lanier Corp.—Harris hasn't restated its results for 1982 with the inclusion of Lanier as yet, and therefore these figures could change. DATAMATION estimates that dp revenue for the combined company reached $580 million, including an estimated $275 million from Lanier's word processing line.

The merger with Lanier was done on a stock swap basis, but the value of the deal was about $275 million. Wall Street skepticism about the merger pushed Harris stock down; since then the stock has recovered.

Harris is divided into five operating groups. The largest of these is the government sector, which contributes about half of Harris's total revenues. The communications sector, with a large portion of its sales overseas, particularly in developing countries, has had depressed revenues. Harris is therefore trying to redirect its marketing efforts toward developed countries, particularly the U.S. The semiconductor sector is experiencing increased sales as demand grows. Harris is in a particularly good position in semiconductors because it has redirected its product line away from the competitive RAM market and into the 16-bit CMOS microprocessor market.

The information systems sector, which is primarily data processing, has problems, the main one being the terminal business that DATAMATION estimates was relatively flat for calendar 1983 with sales of $115 million. Another factor hurting the information systems sector was its dependence on overseas business, where the ongoing recession caused sluggish sales for Harris.

In Lanier's Atlanta headquarters there has been good news. This manufacturer of dictating machines and word processing equipment has been successful with its latest line of wp equipment after switching from a line manufactured by another firm.

Wall Street analysts remain skeptical about Harris's future in dp. The big question is, how will the merged companies combine Lanier's marketing ability with Harris's technology to become a strong contender in the office automation market? It will take two or three years to answer that question.

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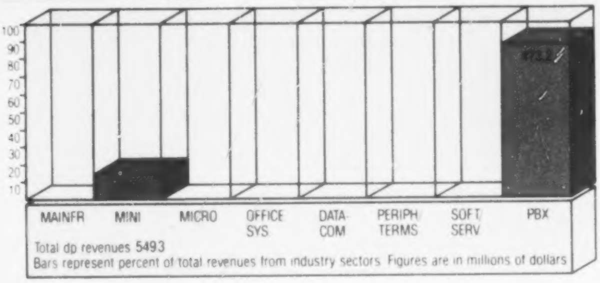

Total dp revenues 5493
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

ROLM CORP.

4900 Old Ironsides Rd.
Santa Clara, CA 95050
(408) 983-2900

There is an old Chinese curse to the effect, "May you live in interesting times." Rolm certainly found 1983 to be interesting. Revenues continued to rise, income was up, major new products were announced on schedule, lawsuits were begun and completed with minimal disruption of business, and, oh yes, IBM deigned to take an interest in the company.

For the year, revenues climbed 23% to $549.3 million while earnings inched upward 3.3% to $34.1 million. While still healthy—especially considering Rolm's size—1983 did mark a slowing from previous years. In 1982, by comparison, Rolm's revenues grew 35% over the previous year and income jumped 26%. A significant amount of would-be net income was invested in R&D, which jumped to $41.3 million, 42% more than 1982.

Both of Rolm's primary businesses fared well during the year. The Mil-Spec division, which sells minicomputers to the military, saw a 22% gain in revenues, to $76.1 million. The business communications division, which is the CBX family of private branch exchanges, grew 23% to $473.2 million.

The CBX business hit the headlines several times throughout the year. In February, Rolm sued Plessey Telecommunications Ltd., a British firm that Rolm said misused Rolm technology and copyrighted software. Rolm sought to enjoin Plessey from selling a PBX it said was based on the CBX, and asked for $100 million in damages. By November, however, the two sides had agreed to an amicable settlement in which Plessey would pay Rolm an undisclosed amount for a licensing agreement so that the former could continue to sell its PBX products.

Also in November, Rolm introduced the first major revision of the CBX switch, called the CBX II. The product will replace four of the five types of switches Rolm sells. Its largest configuration can handle 4.4Gbps, which gives users ample room for future expansion of their voice and data communications networks. The CBX II family is completely compatible with the CBX family, which was limited to 740Mbps. Rolm said the CBX II, which cost $80 million to develop, will eventually account for 70% of its corporate revenues. By comparison, the CBX family currently accounts for 86% of corporate revenues.

The news that got Rolm the most headlines during the year, however, was its partial purchase by IBM. The leading computer maker agreed in June to purchase less than 30% of the company, and as of early 1984 had 19.1% of the shares of the company and two representatives on Rolm's nine-member board of directors. Both companies were developing ways for IBM computers of all sizes to communicate over Rolm data communications switches. That intent was apparent even in February, when Rolm announced a gateway product that allowed the CBX to connect into SNA networks.

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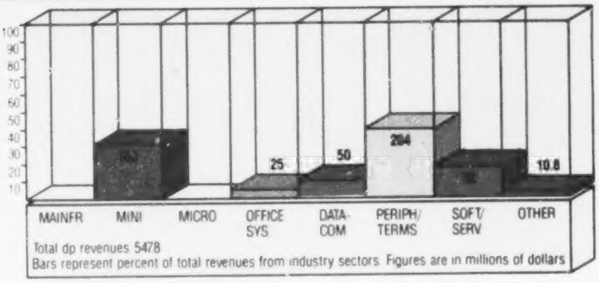

Total dp revenues 5478
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

DATAPOINT CORP.

9725 Datapoint Drive
San Antonio, TX 78284
(512) 699-4428

Datapoint returned to profitability during 1983, but the disastrous accounting scandal took its toll on the company. Revenues for calendar 1983 rose 6.8 % to $547.8 million, from the $512.9 million reported a year earlier. Earnings increased also, but were far from Datapoint's historical levels. The company posted earnings of $13 million for calendar 1983 vs. the loss of $7.9 million in 1982.

The accounting scandal of late 1982 took Datapoint and Wall Street by surprise. The company responded by firing a number of executives, and taking huge writeoffs during the year. Time spent on financial problems would have been better spent on new products, because Datapoint lost some of its competitive edge in a number of markets. The next generation of products isn't due out until mid-1984 and will not help the company much during 1984.

New products in 1983 were limited to enhancements of the existing product line. For example, at the lower end, Datapoint announced the 1560 Small Business Computer System, an entry-level system that can expand from a standalone system to multiple interconnected processors on an attached resource computer or local area network. Datapoint also upgraded its 8600 series system with the lower-cost 8625, the 10MB disk, 1MB diskette system. Late in the year, Datapoint introduced the 8640 system, which features 512K memory, and adds a new disk system expandable to 130MB.

To make sure another scandal never darkens its doors, Datapoint brought in a number of new executives from such classy companies as Data General, Motorola, Sperry, Digital Equipment, and Xerox.

Datapoint also divested itself of a few subsidiaries during 1983. It sold its subsidiary in Denmark and its 50% interest in Texas Peripherals to its partner, Tandy. In addition, Datapoint transferred the assets of its money-losing Communications Products Division to a new entity. Datapoint retained a minority interest in the new company.

Datapoint's management kept a tight lid on expenses during 1983, but did increase R&D a bit to $47.3 million, up from $44.6 million in 1982. Obviously management is hoping that new products will pull the company out of its doldrums.

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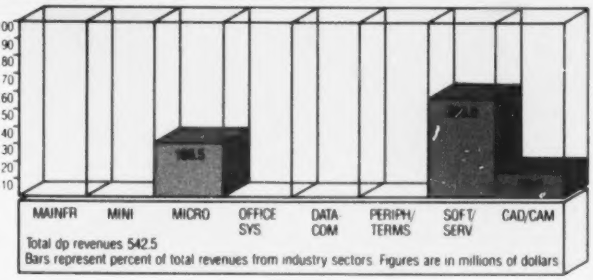

MCDONNELL DOUGLAS CORP.

P.O. Box 516
St. Louis, MO 63166
(314) 232-0232

Everything was up, up, and away for McDonnell Douglas Automation Company (MCAUTO). Even Wall Street's disapproval of the parent company's acquisition of Tymshare couldn't alter the company's direction.

The statistics went only one way. The bottom line on total corporate revenue was $8.1 billion, an 11% increase over 1982's $7.3 billion. Net income more than doubled that performance, rising 28% to $274.9 million from $214.7 million.

Dp was a major player in this movie. Total dp revenue from commercial sales also went up, jumping 14% to $542.5 million from $476.4 million. Total dp revenues, including sales to internal divisions, reached $780.5 million, a 4% increase over 1982's total of $747.9 million. There was much cheering over MCAUTO's commercial revenue performance. That rose 15% to $376 million. Thus MCAUTO accelerated the 1982 trend of selling more to outsiders than insiders.

McDonnell's other dp arm, Microdata, also had a good year. Sales were up 12% to $166.5 million from $148.1 million. Unigraphics, the company's CAD/CAM system, won the gold star: sales jumped 47% to $70 million.

Not content with playing a pat hand, both MCAUTO and its parent added significant new cards to their deck. MCAUTO in May bought the assets of Insight Technology, Whitinsville, Mass. Three months later, MCAUTO acquired a minority interest in Sanus Corp. Health Systems.

These acquisitions were part of a grander scheme, which culminated with the purchase of Tymshare. McDonnell Douglas had been coveting the timesharing company since November. The two parties had actually agreed—at least in principle—to a deal wherein McDonnell Douglas would pay $31 per share for Tymshare. That deal fell through about a month later. But the two resumed discussions early this year, which eventually led to McDonnell Douglas's forking over $25 per share.

McDonnell Douglas then played its trump card. It announced in March the formation of an Information Systems Group, composed of MCAUTO, Vitek, and Microdata. Tymshare will be added as soon as the paperwork is straightened out. The new group is chaired by McDonnell Douglas president John McDonnell.

The group expects sales to reach $1 billion in 1984. A large portion will undoubtedly come from the newly formed McDonnell Douglas Health Systems, which includes MCAUTO's Health Services Division and Vitek. The Health Services Division provides dp services to one out of every five hospitals in the U.S. Vitek alone serves 330 hospitals in the U.S. The company clearly expects those numbers to rise, just as its performance did in 1983.

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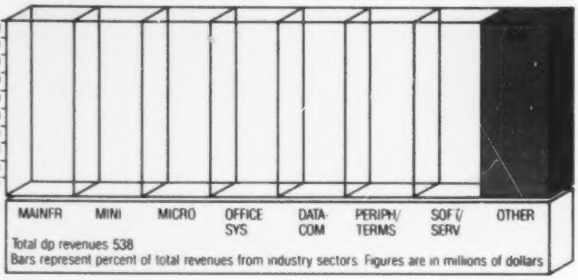

COMDISCO INC.

6400 Shafer Court
Rosemont, IL 60018
(312) 698-3000

Comdisco has existed as a flea on giant IBM's back, and 1983 proved to be a bumpy ride for the computer leasing company. For one thing, the giant became a direct competitor to Comdisco, as IBM stepped up its leasing activity with a partnership of two financial powerhouses, Merrill Lynch and Metropolitan Life. Despite this new competition, Comdisco's performance for calendar 1983 appeared good: revenues increased 9% to $538 million, and earnings soared 52% to $49.0 million from $32.2 million a year earlier.

Behind these numbers, though, linger big problems for Comdisco. The roof fell in in October, when a magazine article questioned Comdisco's accounting practices and the whole process of third-party leasing. The power of the press was immediately apparent. Leaseholders got nervous and stopped leasing. The IRS got curious and began investigating. And shareholders got scared and started selling. By February, when the annual meeting took place, the stock had dropped 70% of its value, and first-quarter earnings were off 25%.

Kenneth Pontikes, founder and chariman, explained at the annual meeting that the questioned practices only accounted for 12% of Comdisco's total revenues in fiscal 1983, but that hasn't convinced investors—the stock still languished in the low teens, from a high of $40.

Security analysts remain optimistic. They say that if the tax shelter aspect of such deals can't be sold, then the leasing industry will, in the long term, raise rates to compensate for the loss of revenue. As John Keefe of Drexel Burnham Lambert explains, "Right now there is uncertainty, and how long this will last is hard to say, but Comdisco's basic strengths are strong."

Comdisco introduced new products that don't rely on the tax shelter approach. One program permits a customer to shop around and pick out the equipment that it wants; then Comdisco purchases it and leases it back to the company. This gives the lessee much more control over the equipment it uses. Another program allows a customer to test IBM's new extended architecture equipment before committing to a purchase.

One of Comdisco's big hopes has been long in materializing. The Disaster Recovery Service division, hot sites filled with IBM mainframes and available in case of a disaster, remained in the red in 1983. Pontikes, however, predicts a profit for 1984.

With 1983 ending up a very volatile year for Comdisco, the company faces many unknowns, which will certainly test Pontikes's management skills.

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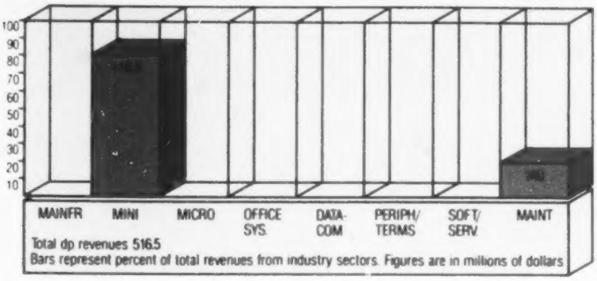

PRIME COMPUTER INC.

Prime Park
Natick, MA 01760
(617) 655-8000

Prime found 1983 tough going. Revenues were up a respectable 19% to $516.5 million, but earnings fell 27.6% to $32.5 million from the $44.9 million of 1982. Most of the earnings slack came early in the year, as Prime struggled to get costs under control. One move to cut costs involved the direct sales force, since the number of branch offices were cut from to 44 from 58. In addition, a number of sales management layers were eliminated to centralize selling to major accounts.

These moves were of limited financial success during the year, in part because of the tremendous competition in the minicomputer market. Data General currently has the price/performance lead with the MV/10000 and is putting a great deal of pressure on the market. Sales of Prime's high-end 9950 supermini were strong after its midyear introduction, and analysts estimate this machine now represents about 20% of total volume. The earnings decline does show that Prime's prior premium pricing approach is now softening. The 9950 was also the first commercial minicomputer to use emitter coupler logic (ECL) chips, though other companies soon followed.

Prime's fastest growing business is in the CAD/CAM market, which analysts expect to remain hot in 1984. Prime acquired the Medusa (solids modeling) and other software packages, such as EDMS (electricial design) and PDMS (plant design), and they are considered critical to the company's long-term future. Indeed, Prime's CAD/CAM revenues are now less than 20% of the total but could exceed 40% in the next three years if the company's planned efforts are successful.

Prime faces a much tougher environment than ever before. How its 9950 supermini will stack up against DEC's forthcoming top-of-the-line entry remains to be seen. The company is also facing a number of unknowns in the small supermini market, where its model 2250 faces DEC's MicroVAX models and Data General's MV4000, formidable competition both.

The company lost a number of senior sales and research people last year, as president Joe Henson revised the corporate culture to reflect a more mature organization. Several of Prime's former executives left to form other companies now in the supermini business, but Henson is optimistic about the company's future: "During 1984, we plan to continue our aggressive new product introduction schedule, and our strategic investments in R&D, customer service, and marketing programs. We believe our investments in 1983 have positioned us well to benefit from an improving economy."

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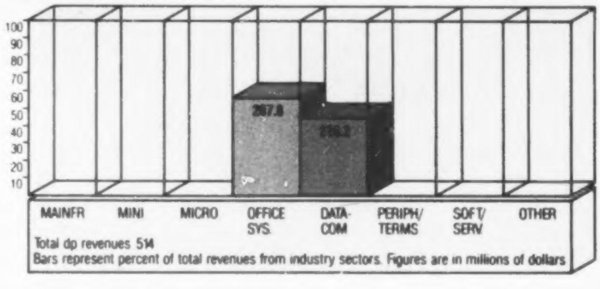

MOTOROLA INC.

Motorola Center
1303 E. Algonquin Road
Schaumburg, IL 60196
(312) 397-5000

Motorola's semiconductor business drove its revenues and profits in 1983: last year's operating profits from chip sales exceeded the company's whole pretax income for 1982. Net sales hit $4.33 billion, up just over 14% from the year before, and net earnings were $244 million, up 37%. Dp revenues—from office systems and data communications—kicked in $514 million to total revenues but contributed little or nothing to profits.

The Codex Corp., Four-Phase Systems, Universal Data Systems, and the International Division make up Motorola's Information Systems Group, and in 1983 the information wasn't terribly cheering. Four-Phase discontinued a line of central processing equipment in the fourth quarter and the resulting $11 million write-off produced a $5 million loss for the group. Despite a big order from the IRS and in-house optimism about MAESTRO, a software development system built by the European software house Softlab, the news from Four-Phase is expected to remain gloomy for a while longer. An expected strong performance from Codex and a probable improvement in international trade, however, should help boost the group out of the red for 1984.

The news from Motorola's communications businesses was better, but not thrilling: profit margins that had traditionaly held at about 12% dropped last year to 5.7%. But a turnaround that began in the third quarter and intensified in the fourth quarter suggests that much rosier reports will be written about 1984's performance. Sales of Motorola's early entry in the advanced car-telephone sweepstakes are encouraging. Certainly, Motorola means to buy a hunk of future success: it accelerated its communications R&D investment by 24% in 1983. (Overall corporate R&D spending rose to $336 million from 1982's $278 million, an increase of just over 20%.)

Motorola's Communications Group is the source of a marketing victory that has cheered other companies faced with competition from the Japanese. The battle ground: pagers. When the intrusive little devices took off, the Japanese moved in. But Motorola fought back, and the pager remains an item in the American profit column.

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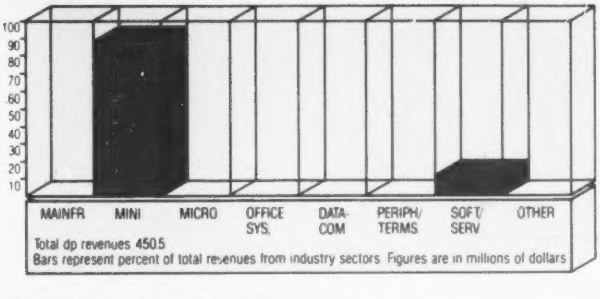

TANDEM COMPUTER INC.

19333 Vallco Parkway
Cupertino, CA 95014
(408) 725-6000

The days of runaway growth have slowed for Tandem Computer. Last year the Cupertino company's dp revenues, according to DATAMATION estimates, were up only 34% to $450.5 million, compared to the 41% and 88% gains posted in 1982 and 1981, respectively. That 34% increase is still nothing to sneeze at.

Tandem is indeed in the pink of health—an examination of its finances proves that. Helping out those finances is minicomputers, which continue to be the mainstay of the company's business. In 1983, Tandem's total revenues in that sector were up 28% to $400 million.

A pioneer in the fault tolerant systems field, Tandem was in the black in its third year in business. And that business began booming. That boom was reflected by the company's phenomenal growth rates—growth that has gradually tapered off in the past few years. Also getting smaller are the company's inventories. Last year, Tandem launched a major effort to reduce its high inventories, a move that caused its per share earnings to dip slightly.

Tandem also increased capital spending and enlarged its sales force, setting up a separate federal government sales division. There was no such expansion drive in Europe, where Tandem decided to consolidate its operations, which pull in approximately 24% of the company's revenues.

On the manufacturing front last year, Tandem opened up a new automated facility for board assembling and testing in Watsonville, Calif. It also opened up an LSI lab for prototype chip development.

The company continued to be one of the major players in the on-line transaction processing market—a market that is expected to be worth a walloping $28 billion by 1986. Tandem's 16-bit NonStop line of fault tolerant systems, introduced 10 years ago, got a big piece of that action, and its new 32-bit line of processors, the TXP, is doing well. Since then, the company has steadily increased its customer base. Last year it signed up 126 more customers, 47 of them in the fourth quarter.

To enhance its fault tolerant family, the company came out with Fox, a fiber optic extension that can tie up to 224 NonStop processors into a local area cluster. On the software side, Tandem announced the Snax package, which enables its Expand network customers to access SNA facilities.

More than 75% of Tandem's NonStop systems are sold to end users who develop their own application programs. The remaining 25% are oems and hardware/software development companies. Tandem seems to be putting more emphasis on the software side. Last year it launched the Alliance program to strengthen its relationship with software houses, and further insulate it from the recent entries in the fault tolerant market.

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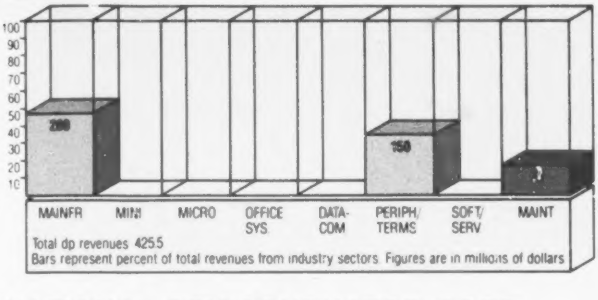

NATIONAL SEMICONDUCTOR CORP.

2900 National Semiconductor Drive
Santa Clara, CA 95051
(408) 749-7420

The sharp turnaround in the semiconductor trade left National Semiconductor Corp. gloating over its revenue gains. And rightly so. Following two successive years of disheartening losses, National Semi finally returned to profitability in 1983, with net earnings skyrocketing threefold to $24.2 million.

National Semi's dp revenue in 1983 rose 16% to $425.5 million. The bulk of those earnings stemmed from the mainframe side, which posted a 14% revenue increase to $200.5 million. Responsible for this revenue rise is National Semi's National Advanced Systems unit, which peddles Hitachi's medium- and large-scale IBM compatible systems. National Semi also derived some additional revenue on the peripheral side from Hitachi. In the peripheral and terminal sector, the company scored a 25% increase, bringing the total take there to $150 million.

Some of that revenue was contributed by National Semi's point of sale (POS) operation. That operation was in turn helped out by the acquisition during the year of Data Terminal Systems Inc., the Maynard, Mass., maker of computerized cash registers and checkout systems. On the heels of the takeover last June, six executives resigned from DTS, which had reported a 34% drop in revenues to $78 million in 1982.

Undisturbed by this decline, National felt the DTS products would help expand its line of supermarket checkout systems. The new subsidiary, which combines the two operations, is called National Semiconductor Datachecker/DTS Corp.

During 1983 the company's NAS unit expanded its top-of-the-line AS/9000 series to include five processors that compete with the IBM 3081 and 3084. On the peripherals front, National announced several new products including the 7380 disk storage subsystem and two entry-level tape drives/controllers.

National also continued to spend heavily on R&D last year. During FY83, R&D expenditures climbed 13.6% to $109 million. Much of that investment is directed at new products, and many of those new products are in the semiconductor sphere. While not included in this survey, semiconductors, which are the backbone of the dp industry, are the real basis of National's business. Last October, the Silicon Valley firm announced the 32032, the industry's first commercially available 32-bit chip, which sells for $220 in quantities of 100 or more.

A month after this announcement, IBM amended its complaint that alleges NAS stole trade secrets from the company. IBM's claimed damages ranged between $750 million and $2.5 billion. Most industry watchers and Wall Street analysts don't believe the suit will amount to much. They're also predicting that the explosive demand for semis will rocket National Semi's earnings ever higher.

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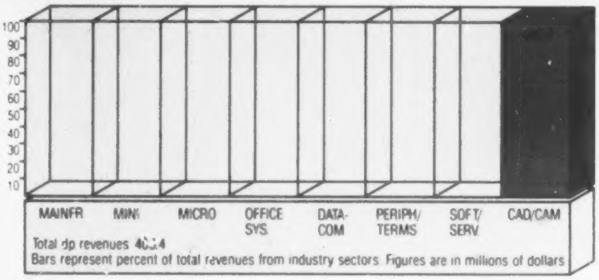

COMPUTERVISION CORP.

201 Burlington Rd.
Bedford, MA 01730
(617) 275-1800

For Computervision, 1983 was mediocre. Revenues in 1983 climbed 23% to $400.4 million, keeping the company firmly entrenched as the market leader in CAD/CAM and computer aided engineering products. Income, which grew by a measly 2% in 1982, climbed 9% to $35.4 million in 1983. The company's work force however, grew in parallel to revenues, with the payroll totaling 5,000 employees, a 21% hop over 1982.

Clearly, all is not well at Computervision. For while it grew modestly and reversed its declining revenue growth trend, its competitors soared during 1983. Intergraph, the leading challenger to Computervision's dominance, grew 62% to $255 million in 1983 from $155.6 million in 1982. So while Computervision is still the market share leader, its position may be threatened in the next few years by Intergraph and by other competitors like Auto-Trol and GE's Calma.

Computervision's inability to keep pace with the exploding market is directly attributable to the company's past insistence on a vertically integrated approach. It has been the only company to build its own hardware rather than buy hardware from outside sources and write software for it. Intergraph, for instance, has been highly successful buying DEC minis as host processors. Analysts of the company for years have been stressing the importance of dropping the hardware component of their product and replacing it with purchased hardware, to no avail.

The rationale for keeping the hardware development in-house is that the company could then guarantee upgrade paths for its users. The drawback is that Computervision's hardware line is almost entirely 16 bit in an age where 32-bit cpus are increasingly common in CAD/CAM. The result is that some of Computervision's customers have been switching to other vendors. Backlog at the end of 1983 was $91 million, only 16.7% greater than at the end of 1982, indicating that the first half of 1984 could mark a renewed decline in earnings growth.

Computervision took the first steps away from vertical integration in 1983 when it announced two separate oem agreements through which IBM and Sun Microsystems would begin providing hardware to the company. And the company boosted R&D spending 20%, to $36.3 million, indicating that it is prepared to spend the money necessary to rewrite its applications software for the purchased 32-bit systems.

Company management recognizes that the firm is in for a rough 1984. The CDS-4000 and Designer V-X systems, introduced last year, incorporate the new CADDS 4X software, which should help the company's revenues substantially. That may be offset by continued erosion of foreign earnings because of the strength of the dollar overseas.

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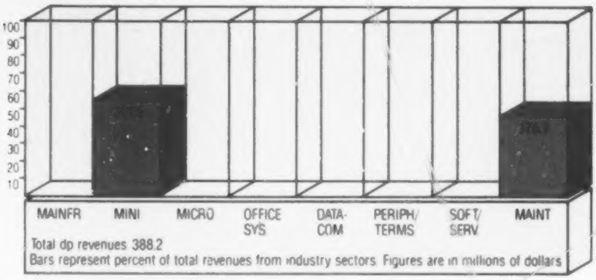

MANAGEMENT ASSISTANCE INC.

560 Lexington Ave.
New York, NY 10022
(212) 909-1400

Management Assistance Inc. had in 1983 what its management called "a year of transition." Hardware sales at the Basic Four subsidiary fell for the second year in a row while service/maintenance revenues rose at both Basic Four, internationally, and Sorbus, domestically.

Total revenues for MAI in calendar 1983 were $388.2 million, up from the $354.2 million registered the year before. Profits, however, fell to $1 million from the previous year's $6.3 million. Service revenues totaled $169.2 million while minicomputer revenues were pegged at $211.5 million.

While continuing to build small business systems that run a proprietary operating system, Basic Four last year moved to strengthen its standing in the packaged software market. In addition to sharpening its focus on a number of vertical markets where it competes with specialized software companies, Basic Four repackaged its general accounting software for the IBM and Tandy personal computer markets. The company sees its new software business as a promising new revenue stream as well as a long-term opportunity for future upgrades of pc users to the Basic Four hardware line. The software will be sold through Radio Shack computer stores for use on that firm's TRS-80 model 2000 and through other retail outlets for IBM PCs.

Basic Four last year also introduced the first model in a new line of 32-bit virtual memory systems, the MAI 8000. It uses proprietary hardware configured in a multiprocessing, multi-user system and sells in the U.S. for $30,000 and up.

Basic Four showed a loss of $10.2 million for fiscal 1983, compared to a profit of $6.99 million the previous fiscal year. In contrast, the firm's service operations—handled by Sorbus in the U.S. and Basic Four abroad—showed a profit of $28 million for fiscal 1983. Approximately 40% of Sorbus' revenues come from servicing Basic Four equipment in the U.S., with the rest derived from maintenance contracts with other manufacturers and contracts with end-users for servicing a wide range of IBM equipment. Sorbus last year moved aggressively to expand its servicing of personal computers of all kinds, offering depot maintenance for small users and on-site services for large corporations that use a mix of different machines.

MAI entered 1984 with its management trying to fight off a dissident shareholder, arbitrator Asher Edelman. At the annual meeting, Edelman won four seats on the company's board. Both Edelman and MAI's management announced they had had talks with several companies that had expressed interest in acquiring MAI. Edelman, however, vows to fire MAI's chairman Raymond P. Kurshan, but comments that he doubts that he has enough votes right now. Keep tuned for the perils of MAI.

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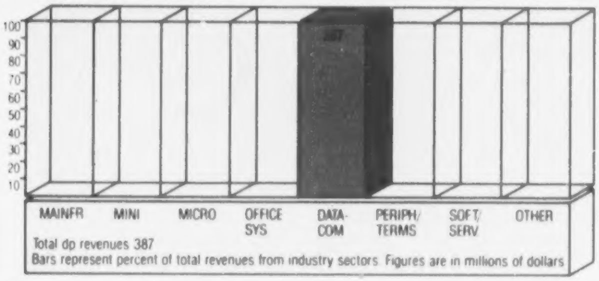

Total dp revenues 387
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

RACAL DATA COMMUNICATIONS INC.

8600 N.W. 41st Street
Miami, FL 33166
(305) 592-8600

Modems mean money to Racal-Milgo, the separately run American subsidiary of the $1 billion British company Racal Electronics Plc. Last year was another good year for the merry modem maker, which registered a 29% revenue rise to $387 million. This was an improvement from 1982, when it recorded a 25% revenue hike.

All these sales didn't generate happiness, apparently, because the British parent sent in a new manager during the year. Edward Bleckner was appointed president, and later promoted to chairman, and ceo. Apparently the problem was an accounting nightmare blamed on Racal-Milgo's fast growth. The problem was solved only after 40% of the work force was laid off. To boost its revenues and image, the parent has opened a New York office and hired a public relations firm. Another expected move is a big push into the CAD/CAM market, where Racal Electronics claims to have captured 44% of the business in Europe. Approximately 26% of Racal-Milgo's revenues are generated from foreign sales.

The company was formed in 1955 as Milgo Electronics Corp. and was bought by Racal in 1977. The Milgo operation handles higher-speed modems and the more sophisticated peripherals. Racal Electronics has also purchased Vadic, which produces low-speed modems.

One of its more sophisticated peripherals—the dial-up Datacryptor II—was unveiled last year. The $2,300 device encrypts data on circuit-switched networks. It operates in half- or full-duplex modes, synchronous or asynchronous, at up to 9.6Kbps. In early 1984, Racal-Milgo introduced two cost-saving options for its Omnimux series of statistical multiplexors.

When Racal Electronics Plc. announced its midyear results, it became apparent that the parent was very happy with the changes in Miami. As Sir Ernest Harrison predicted, "The Data Communications Group will be the largest contributor to sales and profits by the end of the current fiscal year, due in large measure to the strong performance in the United States."

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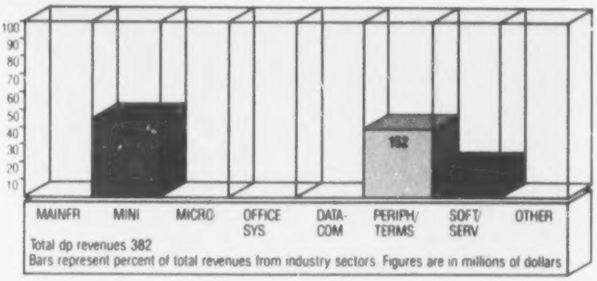

Total dp revenues 382
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

MOHAWK DATA SCIENCES CORP.

7 Century Drive
Parsippany, NJ 07054
(201) 540-9080

Mohawk Data Sciences muddled through 1983 much as it did in 1982. Once again, revenues increased modestly and earnings fell more significantly. In 1983, corporate revenues increased 10.7%, to $400 million from $361.3 million, while income dropped 29%, to $9.6 million from $13.5 million. In 1982, by comparison, revenues rose 12.6% and income fell 18.3%.

Dp accounted for over 95% of corporate revenues, down slightly from 1982, but that is due more to the strength in MDS's Dek Identification Systems division, which makes color photo identification cards for drivers' licenses. Dp revenues grew 9.5% in 1983, to $382 million from $348.9 million.

The MDS Systems division, which sells distributed processing systems into the IBM mainframe environment, was sluggish throughout the year. Profits were depressed also, in part because it conducts 35% of its business overseas and was hit with currency-translation losses. The division introduced the Personal Computing Attachment to its Series/21 line of processors. Essentially, it allows Series/21 terminals to access CP/M software stored in the host processor; the terminals are still dumb, however. The division also premiered the Hero intelligent workstation, a version of Convergent Technologies' N-Gen 16-bit microcomputer custom modified to operate in the Series/21 environment; it was the first version of N-Gen to make it to market. Over the year, the Systems division recorded a 4.8% increase in peripherals and terminals revenues, to $152 million, and a more substantial increase in processor revenues.

The MDS Qantel division, acquired in 1982, continued to perform well, registering a 12.8% growth rate. The division continued to specialize in selling minicomputer-based vertical market turnkey systems. A majority of the teams in the National Football League, a handful of professional baseball teams, several college football teams, and other sports franchises have installed the Sportspak version of the Qantel computer systems. Late in the year, Qantel introduced a hotel and motel management system similar in nature to the sports management system.

The MDS Trivex division, formerly an independent supplier of 3270-compatible terminals, essentially disappeared during 1983. The Systems division absorbed all of its U.S. business, including the name, while in Europe the division's name lives on, although its product line has been merged into the Systems division.

R&D expenses remained constant at $23 million, less than 6% of 1983 revenues, despite the introduction of the Qantel vertical package and the two Systems products. Employment increased 2%, to 5,500 worldwide. Management expects that 1984 and the future years will see MDS rebounding, as the new products reach their peak earning potential.

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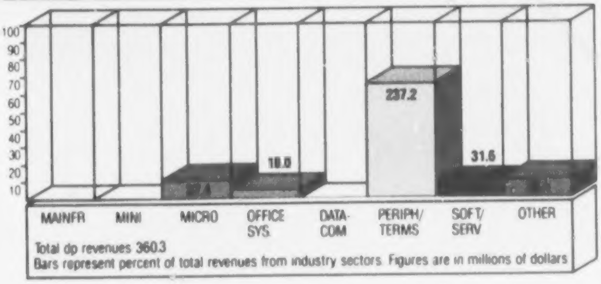

C. ITOH ELECTRONICS INC.

5301 Beethoven St.
Los Angeles, CA 90066
(213) 306-6700

This U.S. subsidiary of the Japanese trading firm C. Itoh & Co. had revenues of $440.3 million last year, $360.3 million of which was derived from computer-related equipment. These figures compare favorably with last year's, which showed revenues of $326.4 million overall and $290.6 in the dp field. While building no hardware itself, C. Itoh Electronics imports micros and small peripherals into the U.S. market and exports U.S. goods to foreign markets, particularly Japan.

Last year saw C. Itoh Electronics record micro revenues of $37.4 million, office systems sales of $18 million, and peripherals sales of $237.2 million. In addition, revenues of $31.6 million in software and $36.4 million in miscellaneous dp goods were recorded. Employment rose to 1,140 persons, up from 800 in 1982.

The company established a new subsidiary, CIE Terminals Inc., in Irvine, Calif., to sell terminals and printers to OEMs and distributors. Among several new products introduced last year were the CIE 7800, a line of 3270-compatible units, a color terminal, and products designed to display graphics. Approximately $22 million worth of terminals were sold last year.

C. Itoh Electronics' export activities include shipping goods to Japan and Europe from more than 50 U.S. manufacturers. In the U.S., it represents more than 10 Japanese makers of peripherals and systems including General Corp. and Tokyo Electric. The company is also involved in venture capital financing of technology oriented companies.

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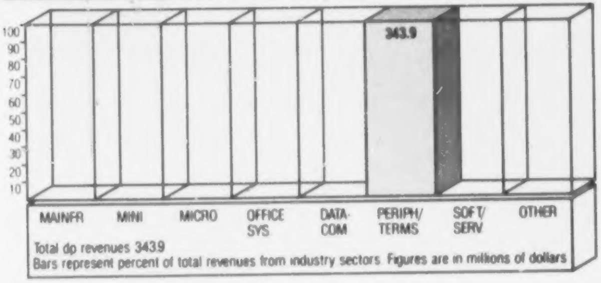

TANDON CORP.

20320 Prairie St.
Chatsworth, CA 91311
(213) 993-6644

Sirjang Lal (Jugi) Tandon's company could be rated an overnight success. Started on a shoestring investment of $7,000 in 1975, the company was well on its way to becoming the industry's dominant 5¼-inch disk drive supplier by 1979. Today Tandon is 50 times the size in both sales and assets that it was back in 1979, when the first disk drive rolled off the production line. Those drives are continuing to roll off and the profits are also continuing to roll in. Last year Tandon's dp revenue skyrocketed 94% to $343.8 million, making it one of the top growth gainers in the DATAMATION 100. Profits blossomed also, up to $27.2 million, a 43% increase over 1982's $19 million.

That profit picture would have been even brighter if Tandon had not made a $12 million provision for bad debts because of its riskier microcomputer customers, like Victor Technologies. Despite this $12 million receivable, Tandon is continuing to ship, on a cash basis, to the financially troubled micro maker. There is no such risky business on the part of IBM, a large and loyal Tandon customer. In fact, Big Blue was responsible for approximately 21% of drive sales in fiscal '83.

Tandon's business is drives—floppies, Winchesters, and tape cartridge varieties. The company's 1983 share of the U.S. and European market for 5¼-inch OEM floppies was estimated at 50%. In July, Tandon bolstered that position by capturing a $310 million contract from a mystery micro maker.

Tandon's success formula, however, is no mystery. Low pricing strategies have clearly put the company in the driver's seat in the drive market. It has managed to consistently achieve those low prices by cutting costs through vertical integration and use of efficient automated production techniques.

To keep those all-important low-unit costs, Tandon poured $21.2 million into new facilities and equipment last year. Some of those big bucks went into expanding production capacity at the company's five disk drive and subsystem plants in Southern California and Singapore. Engineering and R&D expenditures more than doubled in FY 83 to $13.7 million. Gross profit was 27.5% of sales—down from 36% because of costs associated with new product introductions and related expenses.

Tandon hedged its bets by focusing on the high as well as the low end of the microcomputer market. The company came out with a 5¼-inch Winchester subsystem that expands IBM PC memory capacity either 10MB or 15MB for under $2,000. For the transportable pcs, Tandon unveiled the Thinline family of 5¼-inch Winchesters that are 1.6 inches high and microfloppy drives that use 3½-inch diskettes.

In 1984 Tandon seems set to repeat the success formula that's made it the envy of micro drive suppliers everywhere. With drive like that, the company will be hard to stop.

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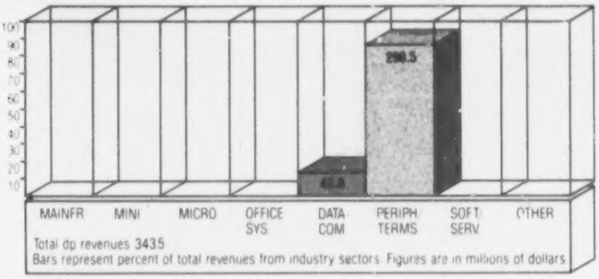

Total dp revenues 343.5
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

DATAPRODUCTS CORP.

6200 Canoga Ave.
Woodland Hills, CA 91365
(213) 887-8451

Dataproducts came bounding out of the recession with its best year ever in 1983. The company recorded $343.5 million in revenues, a 10% increase over 1982. Net income rebounded with an 83% gain to $19.1 million after a 50% decline in 1982. The company's backlog at year-end was a record $185 million, $50 million more than a year earlier, owing to the booking of $110 million of orders in the fourth quarter. During 1983, Dataproducts installed productivity programs to improve its profits picture. These programs have put the company in a good position for continued profits in 1984.

Dataproducts is still the leading independent printer supplier, and in recent years it has moved forcefully to diversify its printer offerings. As late as 1978, it offered line printers and nothing else. Since then, the company has expanded its low-end offerings to include several matrix printers, a daisywheel family, band printers, and thermal printers. In mid-1982 Dataproducts acquired Integral Data Systems, a New Hampshire printer manufacturer concentrating on these low-end systems, and by last year the merger was operating smoothly. Much of the increase in Dataproducts' business, in fact, can be directly attributed to the success of these low-end printers, says company president and ceo Charles Dickinson.

Dataproducts sells its high-end line printers primarily through computer system manufacturers acting as oems, while others are sold more frequently to smaller accounts, such as sophisticated end users who package their own systems. Both ends of the line performed well in 1983, with the line and band printers retaining their market dominance, matrix printer volume increasing, and daisywheel printer shipments beginning to reach volume quantities.

During 1983, like many other dp companies, Dataproducts announced the formation of joint ventures. In July, it entered into an agreement with 3M for the development of printers using nonimpact technology. The first printer, for which Dataproducts will develop the application software and interface, is expected to be shipped by mid-1984. Dataproducts also teamed up with Quality Micro Systems Inc. in a joint marketing agreement under which Quality will supply intelligent graphic controllers for use with a Dataproducts dot matrix printer.

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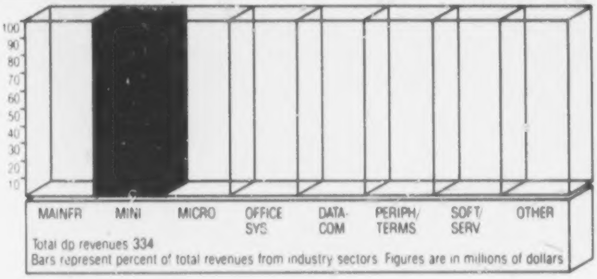

Total dp revenues 334
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

GOULD INC.

10 Gould Center
Rolling Meadows, IL 60008
(312) 640-4000

The recession stifled Gould's computer business last year, but as the economic turnaround progressed, orders rebounded for the company's lines of high performance 32-bit superminicomputers and hardened dp gear. Total corporate revenues inched ahead 5.7% to $1.3 billion in 1983 and dp revenues similarly slogged ahead modestly, to $334 million, up 2.7%. Net income dropped 30% to $64.1 million, mainly because of losses from discontinued operations like its recently sold battery division.

Gould is known as a provider of heavy duty computing power for scientific and government applications. Since it acquired Systems Engineering Laboratories in 1980, new product development has increased and otherwise strengthened the Ft. Lauderdale vendor. Last year the 32-bit line was broadened for commercial markets. New software and terminal products, like Unix, Ethernet, and a line of workstations from Convergent Technologies, look good on paper but haven't helped the company break out of its narrow niche.

Competition among suppliers of 32-bit minis and factory automation equipment known as programmable controllers was fierce last year owing to the dearth of orders from industrial customers. Gould notes that prices plummeted as competitors tried to expand market share. The factory automation market is crowded with powerhouses like Texas Instruments, Westinghouse, General Electric, and a host of smaller players, while the 32-bit field is especially tough with Data General, Prime, Digital Equipment, and other broad suppliers focusing on some of the engineering niches once the exclusive province of SEL and Perkin-Elmer.

R&D spending seems to be part of the prescription for keeping ahead of the competition. At 8.4% of revenues or $111.4 million, Gould's spending is growing faster than revenues.

Now that Gould's chairman William Ylvisaker has kicked out the last of the company's old electrical products, his electronics company has to prove to the outside world that the turmoil in Rolling Meadows during the past four years was worth it. Profit margins and return on equity are not exactly robust, and 1984 will be the first year that the company can be judged strictly on the merits of what it has become, rather than on the hopes and dreams of its chairman.

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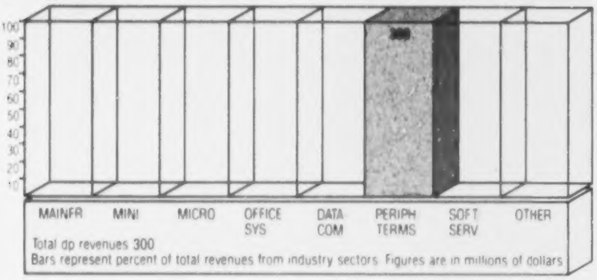

TEKTRONIX INC.

4900 S.W. Griffith Drive
'Beaverton, OR 97077
(503) 627-7111

The opening statement in Tektronix's annual report says it all: "The dill-pickle look on your face says you have just read our highlights, as they are euphemistically called. They once again reflect a tough year. Our earnings took a pasting."

And what a pasting it was. Net income for the year ending Nov. 30 plummeted 39% to $49 million; total revenues at $1.2 billion were relatively flat, as were data processing revenues. All of this left Tek's high-tech spirits pretty low.

DATAMATION estimates that Tektronix's dp revenues for 1983 remained at the 1982 level of $300 million. Included in this dp category are graphics terminals and displays, computers, and hardcopy output devices such as copiers. A world leader in cathode ray oscilloscopes, Tek used to be at the forefront of the graphics terminal trade, but intense competition from new start-up companies dimmed the glow for the Oregon company. Bidding for a comeback, the energetic company has launched an ambitious campaign to recover the lost graphic ground. The enthusiasm is there—at least among Tek employees at the Wilsonville, Ore., plant, who proudly displayed bumper stickers last year declaring, "The Graphics Empire Strikes Back."

It will take more than employee enthusiasm, however, to bring the company back to the position of preeminence it had in the '70s in the graphics terminal realm. Tektronix does nevertheless have a fighting chance. And fighting it is with such products as the high-end 411B and low-end 4107 Unicorn series graphics terminals—both of which were being shipped on schedule last year. Tek is hoping the Unicorn in particular will score big sales, helping it in its comeback campaign.

Realizing that users needed software for specific graphics problems, Tektronix, which has been weak in software development, brought VR Information Systems on to the TEK team last year. The small Austin, Texas, software house specializes in computer aided design applications for electrical engineering. Also on the software side last year, Tek came out with Lands, a software development tool that runs under Pascal.

Some of Tek's problems come from its decision to decentralize its operations. Starting in 1981, the company began dividing up its divisions into business units. Tek believes this divide and conquer approach, which initially creates job duplication, will streamline the company's internal operations, making it more responsive to market and customer needs.

Tektronics is also hoping this strategy will help it avoid the large layoffs it was forced to make in 1982 and 1983. Those were admittedly painful decisions, but necessary if the company was to make it against tough competition. The company is counting on conditions getting better—as one Tek vp described it, "cycling through the whoopsies."

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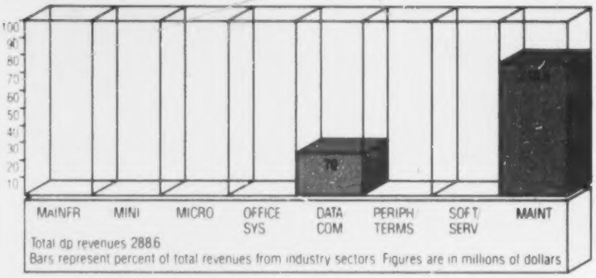

TYMSHARE INC.

20705 Valley Green Drive
Cupertino, CA 95014
(408) 446-6000

Times have been tough for Tymshare, a pioneer computer services company. So tough in fact, that the company accepted a proposed merger with McDonnell Douglas, which Tymshare had jilted just a few months before. Tymshare's dp revenues edged up 6% to $288.6 million in 1983. The company pulled in the largest chunk of its revenues in the software and services category—$218.6 million, up 3% from 1982. The biggest gains, however, were recorded by the company in the data communications sector, which in Tymshare terms means its successful Tymnet data communications network. In the datacom category, Tymshare's revenues were up a healthy 14% to $70 million.

Approximately 40% of the company's operations are devoted to Tymnet, which now spans 450 cities in the U.S. and Europe. Tymshare added numerous cities to the sprawling network last year and plans to add more in 1984. Also on the datacom front last year, Tymshare inked an agreement to acquire international record carrier FTC Communications Inc. It also came out with Micro Engine Inc., a desktop version of its internally designed communications processor.

There is no doubt that the datacom side of Tymshare's business is where the action is. It's also where the action is in the dp industry. Activity in Tymshare's other major business—computer services—has slowed considerably. Market erosion in this sector has been due to falling hardware prices and the arrival of the microcomputer.

This sluggishness in the computer services industry has hurt the 18-year-old company. Realizing the damage, Tymshare had launched various campaigns in an effort to carve out new dp niches. It's also tried to minimize its losses by concentrating on a winner—its Tymnet operation.

This winner was unable to brighten the dismal profit picture. During 1983, Tymshare's net income plummeted a drastic 119%, putting the company in the red by $1.7 million. Burdened by this debt, Tymshare became an obvious takeover candidate. In September, office automation specialists Wang Laboratories Inc. made an unsuccessful stab at Tymshare, acquiring a 4.3% stake. Shortly thereafter, Tymshare began preliminary discussions with McDonnell Douglas. Unable to whittle down the going price of $420 million, the aerospace giant got cold feet and backed out. In early 1984, however, Tymshare lowered the price and is now part of the aerospace industry.

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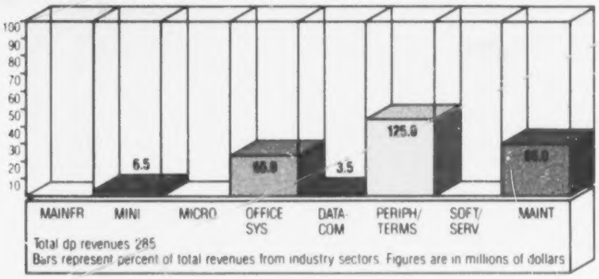

Total dp revenues 285
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

RAYTHEON DATA SYSTEMS

1450 Providence Highway
Norwood, MA 02062
(617) 762-6700

When the 1983 figures were released, the good news-bad news jokes could have saturated the office networks at Raytheon: sales were up, profits were down. Revenues rose 7.7% to $5.94 billion, but, under pressure from what the company called increased R&D, administrative, and sales costs, profits were off 5.9% at $300.1 million. One of the areas reporting increases in all these costs was commercial data processing.

But that expensive R&D is likely to make Raytheon Data Systems' future much sunnier. The end of '83 and the beginning of '84 saw the announcement of several encouraging new products. Already a veteran supplier of 3270-type, IBM-compatible equipment, Raytheon Data Systems announced in September the PTS-1000/4000 family of 3270-compatible displays, printers, and control units. The company plans to make the ergonomic design features of this line a major selling point.

Raytheon is also going after the office automation market with intelligent terminals and microcomputers. Early this year the RDS Signature 8200 workstation made its debut, built around a central processing unit developed by Convergent Technologies using the Intel 80186 microprocessor. The 16-bit machine is IBM compatible, and Raytheon describes it as a "multifunction office system," usable as a standalone micro, a word processor, or a module in a data processing network. The machines will run three operating systems: the RDSOS "host," CP/M-86, and MS/DOS. (The company also announced a sister machine, the 8400, that adds Unix V to the menu of operating systems.) Raytheon obviously hopes the product will broaden its customer base, heretofore concentrated in the defense and airline sectors.

Raytheon can give wide support to its entry into the OA race, with huge corporate resources and 130 facilities and offices located in 35 countries. Building on the experience it has gained in the word processing market since it bought the Lexitron Corp. in 1978, Raytheon must be considered a serious contender in the OA competition.

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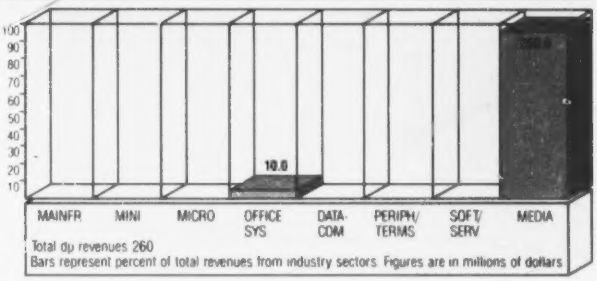

Total dp revenues 260
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

3M

3M Center
St. Paul, MN 55144
(612) 733-9572

3M has come a long way since the 1940s, when it introduced the first commercial magnetic recording tape in the U.S. Today, the Minneapolis media pioneer can claim a product portfolio bulging with over 40,000 items. Most of these, however, are not data processing wares. In fact, the $7 billion company derives only 3.7% of its total revenue from dp.

DATAMATION estimates 3M pulled in approximately $260 million in dp revenues last year—up 16% from 1982. Most of the sales were in the area of magnetic storage media, which hauled in $250 million. This represented an 11% increase over the previous year. The remaining $10 million in revenue came from the office systems side, which includes such things as facsimile and communications terminals, computer output microfilm (COM) equipment, and computer assisted micrographic retrieval systems.

During 1983, 3M continued to focus on the office. To clarify that focus, the company last year merged its Office Equipment and File Management Divisions to form a new Office Systems Division. 3M launched an overall reorganization effort between 1981 and 1982. The revamp, which helped coordinate marketing and planning among the company's sundry divisions and groups, resulted in the creation of four main sectors. The data processing activities were slotted under the Electronic & Information Technologies Sector.

Some of the advanced R&D work at the company is channeled into this sector. Last year, 3M spent $384 million on R&D, compared to $349 million the year before. The company is currently working to develop thin-film magnetic media to meet future computer storage needs. The company is also experimenting with optical technologies that promise high-capacity, direct read-after-write capabilities needed by the next generation of systems.

All this optical research work does not mean 3M has given up on magnetic storage media. A leading mag media producer, 3M continues to concentrate on tape systems and flexible disks, which it expects will achieve a 40% annual growth rate in sales.

3M is also strong in the field of electronic document transmission. The company bolstered that strength this year by coming out with the Whisper Exchange. This system consists of a network of teleprinters that send and receive messages under computer control over telephone lines. Such developments, coupled with the new marketing momentum, should help 3M gain strength through 1984, when the company is expected to post an overall revenue increase of around 13%.

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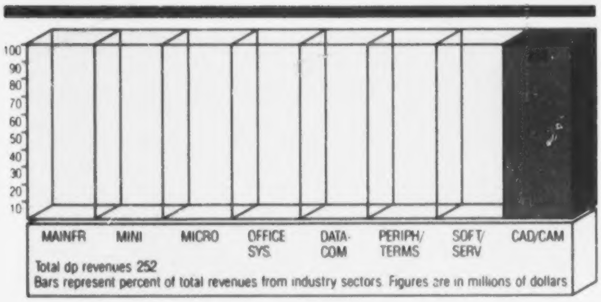

INTERGRAPH CORP.

One Madison Industrial Park
Huntsville, AL 35807
(205) 772-2000

There seems to be no end in sight to Intergraph's phenomenal growth over the last five years. Since 1979, revenues have grown 750% and earnings over 1,000%. In 1983 alone, revenues leaped 62% to $252 million from $155.6 million and earnings bounded 125% to $29.3 million from $13 million. Employment rose almost 40%, to 2,500—a far cry from the 765 employees on the payroll only three years earlier.

Intergraph's growth is even greater than the booming CAD/CAM industry in which it participates. For example, the leader in the industry, Computervision, was only able to post a 23% revenue gain and a 9% income gain in 1983. Intergraph has clearly surpassed GE's Calma, Auto-Trol, and others as the primary challenger to Computervision's dominance in the industry, though it is now only 63% the size of Computervision.

There are several reasons for Intergraph's continued surge. The company has committed itself to developing CAD/CAM/CAE software, using purchased DEC hardware to complete its turnkey systems. The R&D budget was increased 43%, to $28.2 million in 1983, and much of that went to the continuing conversion of Intergraph's applications code to run on the 32-bit VAX superminis. (Computervision, by contrast, is still developing its own hardware and selling 16-bit software.)

Intergraph has also focused its software on eight specific markets rather than selling its product line to all takers. These areas are mechanical design and manufacturing, electronics design, plant design, architectural and engineering design, cartography, geographic information processing, energy exploration, and utility facility management.

The software is written primarily for VMS-based VAX hardware, and can interact with other VMS applications from third parties. The Interactive Graphics Design Software (IGDS) provides a set of programmed design and drafting tools. It features a database with 4Gb resolution per dimension in a three-dimensional design space, allowing massive designs and maps to be constructed. IGDS comes with a library of design symbols, which can be expanded by users, as well as editing facilities and automatic dimensioning.

Intergraph's other primary software product, DRMS, is a data management and retrieval tool for nongraphic information. It allows users to organize statistical data, part numbers, pricing information, material characteristics, and text in support of graphic designs.

These products—and customized versions of them—are sold by Intergraph through a direct sales force in the U.S. and through wholly owned subsidiaries in Brazil, Korea, Japan, and Europe. The company had 800 installed systems worldwide at the end of 1982, the last year that statistics were available.

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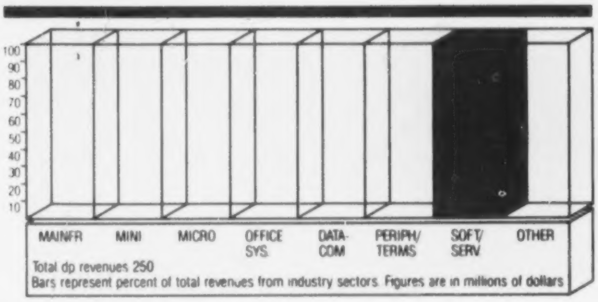

THE BOEING CO.

P.O. Box 3707
Seattle, WA 78124
(206) 655-1131

It's no secret that the remote computer services business is suffering since the advent of micros. Therefore, Boeing Computer Services president Robert L. Dryden had an attentive audience when he addressed the October ADAPSO meeting. Dryden got their attention when he said that "remote computing services companies will not be around in the future unless they meet the challenge of change."

BCS has the distinct advantage of being able to act on Dryden's wisdom because it has a captive audience on which to try new ideas. Boeing produced 60% of the free world's aircraft in 1983, chalking up revenues of $11.13 billion. Net income was equally impressive at $355 million, up 21.5% from 1982's $292 million. BCS had 1983 revenues of about $600 million, of which more than half was from the parent company. Outside revenue was reported at $250 million, up 46% from the previous period.

BCS made many moves during 1983 to combat lagging demand. It expanded its international operations to include Japan and Saudi Arabia, and formed a major systems support group to pursue federal government business. Some of these moves paid off last year as Boeing attracted new clients like the IRS and the Department of Transportation.

Dryden says that by adapting to Boeing's needs, BCS was able to determine what other corporations needed. Therefore, BCS was working on an SNA and X.25 service to include in-house network development and management. In response to the shortage of in-house solutions and technical personnel, BCS is selling training and other services combined with its information processing.

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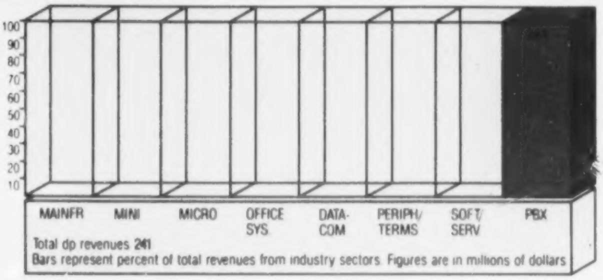

Total dp revenues 241
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

MITEL CORP.

350 Legget Drive
Kanata, Ontario
K2K 1X3 Canada
(613) 592-2122

This Canadian datacom supplier grew substantially in 1983, but earnings were dismal. DATAMATION estimates Mitel's revenues for calendar 1983 at $241 million (U.S.). Mitel's earnings, however, plummeted for the nine months ending Nov. 31—the company reported a loss of $7.2 million (Canadian) vs. a profit of $10.6 million the year earlier. Mitel points out that R&D expenses have grown to $42 million (also Canadian), from the $21 million reported earlier, mainly due to the development of its SX2000 integrated Communications System, which has been stalled in development. One bright note was the fact that initial testing by the British Telecom has been completed and the SX-2000 has been granted approval.

During 1983, Mitel introduced two other new products—Generic 100, which enables the installed base of SX-200 users to integrate voice and data while doubling the capacity of the system, and ACD plus, based upon existing SX-100 and SX-200 hardware. The ACD manages incoming calls for up to 30 telephone agents.

Mitel joined with two U.S. companies in 1983 for a variety of products. A deal with Johnson Controls, of Milwaukee, will provide an interface between Johnson's computerized building automation system and Mitel's "superswitch." This will allow users to manage heating, lighting, air conditioning, and security in conjunction with the data communication system. The partners expect to have a system on the market by mid-1984.

Mitel's other U.S. connection is with Skyswitch Satellite Communications of Denver, which hopes to manufacture and market satellite communications technology previously developed by Mitel.

While moving on many interesting fronts in 1983, it is clear that Mitel had best get its main business and its SX2000 on the road—before a competitor beats it to the punch.

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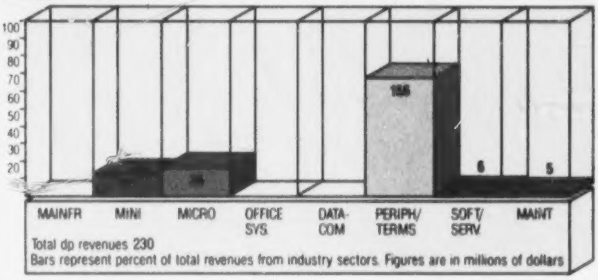

Total dp revenues 230
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

NEC INFORMATION SYSTEMS INC.

1414 Massachusetts Ave.
Foxborough, MA 01719
(617) 264-800

Japan's number three computer maker, NEC Corp., has yet to make a major dent in the U.S. market. Its seven-year-old Stateside subsidiary, NEC Information Systems, has suffered from sluggish sales on the dp equipment front. NEC is nevertheless racking up respectable revenues in America. Last year, dp revenues shot up 44% to $230 million. Most of that revenue came from oem peripherals, such as its popular line of printers, sales of which rose 64% to $156 million. Minicomputer revenues were up over 50% to $27 million, while microcomputer revenues dropped 14.3% to $36 million.

NEC currently has approximately 2% of the U.S. pc market—a poor showing for a company that has managed to capture 45% of its home market. Part of the problem stems from the fact that its 8-bit PC-8000 doesn't run under CP/M. Sales of its newer 16-bit APC (Advanced Personal Computer), which was announced in 1981, are picking up, however.

In addition to the pcs, NEC Information Systems also sells the Astra small business computer in the States. So far the system has not had great success. Maybe the company will have more luck at the high end of the market. That's a hope shared by Honeywell.

Last year the two vendors began negotiating a pact that would give Honeywell exclusive marketing rights to NEC's top-of-the-line Acos 1000 mainframe in North America, Australia, and parts of Europe. Under the deal, the two companies will jointly develop large mainframes and exchange licenses on various equipment patents.

Actually, NEC started in the computer business by licensing Honeywell systems over two decades ago. The new alliance, seen as a counteroffensive against IBM, got both companies out of the sticky situation that found them competing against each other on an important GE Information Systems (GEISCO) contract bid.

NEC's so-called C&C strategy, which combines computers and communications, has worked very well for the company in Japan. It could also work well in America. Earlier this year the company's U.S. communications subsidiary, NEC America Inc. in Melville, N.Y., captured contracts to supply PBXs to several newly unbundled Bell operating companies—U.S. West, Ameritech, and Bell Atlanta. NEC is clearly after a bigger slice of the U.S. PBX pie. This could also be a plus for NEC Information Systems, since NEC PBX customers could well be interested in other NEC wares—namely, small business systems and pcs. If this twofold strategy works, NEC could gain a valuable foothold in the American dp market—a market that has so far eluded the $7 billion Japanese conglomerate.

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PERKIN-ELMER CORP.

Main Ave.
Norwalk, CT 06856
(203) 762-1000

For Perkin-Elmer, 1983 was a year in which everything changed except the numbers. Corporate revenues were up a mere 5.5%, to $1.07 billion, while net income inched forward 1%, to $51.8 million. The Data Systems Group, the firm's only division selling dp equipment, did somewhat better, with a 9.6% increase in revenues, to $225 million. Its pretax profits held steady in the 8% range. Other indicators were also flat: employment increased 1% to 14,372, and R&D stalled at $80.3 million, about 7% of revenues.

Beyond the financial results, however, the Data Systems Group was very much an organization in transition during the year. It began the year as a broad-based minicomputer supplier, selling a range of 32-bit machines to all comers. Most of its sales, however, were to technical and scientific installations. Through the year, the company realized it could not compete with powerhouses such as DEC, IBM, and Data General, and it moved toward a niche approach similar to Gould S.E.L.'s past philosophy. Perkin-Elmer began to concentrate on its scientific and analytic users, and on users who were already familiar with the P-E name from the firm's instrument, semiconductor equipment, and optical products groups. The Data Systems Group also expanded its line of software offerings, hoping to become more of a turnkey vendor to its selected niche.

The company made several new product announcements during the year. It topped off its 32-bit line with the 3200MPS, a multiprocessing system that can be expanded as users' needs increase by plugging in up to eight additional auxiliary processors. Perkin-Elmer also rounded out the low end of the 3200 line with the 3205, a low-priced model designed to appeal to new customers. Later in the year, the 7500 Professional Computer, a 16-bit micro, was introduced. It is the same machine as the desktop micro previously announced by another P-E division for the analytical chemistry market.

Among the most significant of Perkin-Elmer's transitions was a move toward a more open architecture designed to operate in multivendor environments. The PENnet local area network was introduced as the focal point of P-E's new Everyware strategy, which essentially makes P-E equipment capable of running in a wider range of installations. By giving its equipment that capability, Perkin-Elmer hoped to increase its attractiveness in scientific niches within IBM or other foreign shops.

The company was also active on the software side, introducing a major new version of its Edition VII of the Unix operating system, several communications protocols, and a range of application software packages.

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SCI SYSTEMS INC.

5000 Technology Dr.
Huntsville, AL 35805
(205) 882-4800

SCI's 1983 revenues and income soared as high as did some of its magnetic core memories for computers used in the MX missile. This rapid growth can be directly attributed to IBM, which awarded SCI Systems a contract to assemble the circuit boards for the IBM Personal Computer. In calendar 1983, total dp revenues were up more than 200% to $225 million from $80 million in 1982. Corporate revenues were $300 million, up from $133 million in 1982. Net income for the year increased 60% to $6.6 million, as compared with $4.1 million in the preceding year.

Customer orders with a total value of $386 million were received during FY '83 to bring the company's year-end order backlog to $522 million. This represents a 64% increase from the $318 million backlog at the end of the previous fiscal year. They must say "bless the PC" every night.

In addition to the PC, SCI has a family of small business computers that support multiple users in a multitasking environment and also offer a variety of office automation, data processing, and software development capability. The company's rotary printer is sold as a printing mechanism or a complete printer and is part of a number of commercial and military terminals developed by SCI.

During the year, SCI occupied and brought on stream a new manufacturing plant in Alabama, apparently for the PC, and hired more than 1,000 people, bringing the work force to 4,006, up from 2,920 in 1982.

SCI is broadening its traditional customer base from military and aerospace contracts, and has established itself as a low-cost producer of commercial products in large volumes. SCI's success in custom manufacturing the PC will play an important role in the company's plans as long as Big Blue doesn't go elsewhere.

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TELEX CORP.

6422 E. 41st St.
Tulsa, OK 74135
(918) 627-1111

Telex continues to practice the art of beating IBM to the punch in the 3270 terminal and controller markets. While that's not always a good idea—as its fiasco with tape drives a decade ago made clear—it has enabled the company to maintain its position as the second largest 3270-compatible supplier. The firm recorded solid growth for the second year in a row, with revenues climbing 20% to $306 million and net income hitting $33.8 million. Revenues from dp climbed 14% to $221.7 million in 1983.

Telex is divided into two subsidiaries, Telex Computer Products (TCP) and Telex Communications Inc. (TCI). TCP's portion of the company's business continues to rise, hitting 77% of corporate revenues and 84.5% of corporate pretax profits last year. In 1983, TCP benefited from the first significant sales of a pair of products launched in 1982, the TCP-178 display terminal and the PROFFIT desktop workstation.

The TCP-178 is a scaled-down version of the TCP-278 terminal, which is a substitute for the IBM 3278. The 178 was announced nine months before IBM came out with its own 3178 terminal, giving Telex a substantial lead in getting the smaller terminals installed.

The PROFFIT (Professional Office Terminal) was one of the first combination terminal/microcomputer products offered. The product is an attachment to the 278 terminal that gives it CP/M compatibility. While the 8-bit architecture and the need to use two separate housings is behind what is currently considered state of the art, such as the IBM 3270 PC, the product's immediate availability has been attractive to users impatient with IBM's lead times.

54

SEAGATE TECHNOLOGY

920 Disc Drive
Scotts Valley, CA 95066
(408) 438-6550

Seagate jumped into the DATAMATION 100 with a threefold increase in revenues to $221 million, up from the $57 million of 1982. Earnings moved at a faster pace, up 400% to $29.6 million.

It's a case of being in the right place at the right time and, happily, with the right product. Formed in November 1979, Seagate entered the disk drive market as a producer of the 5¼-inch Winchester disk drives. The demand for these products has been nothing short of spectacular, and Seagate has been able to capture large customers, including IBM.

During 1983, Seagate took a number of steps to insure its continued success. For starters the company raised $72 million in a new stock offering. Putting this cash to use was easy. Seagate expanded its production facility in Scotts Valley fivefold. Then it planned construction of a new factory in Watsonville, Calif. In addition, the company opened a new R&D center and a Singapore arm to produce subassemblies.

Perhaps the most important move of the year was establishing a zero defects production line, apparently as a result of vendor concern that the entire disk drive industry was not performing up to par. The company overhauled its operations and opened the Seagate Quality Institute to improve employee training and motivation.

Management was broadened with the appointment of a number of new executives, including Tom Mitchell as president and ceo.

This was done to give founder Alan Shugart more time to focus on the future. Considering how well Shugart has done so far, there probably isn't a more qualified candidate anywhere.

55

SHARED MEDICAL SYSTEMS CORP.

51 Valley Stream Pkwy.
Malvern, PA 19355
(215) 296-6300

SMS continued its history of major growth in revenues and earnings, and displayed a financial performance that compares favorably with the best in the business. Revenues of $210 million were up 27% last year from 1982 and net income also soared to $27.3 million. Its return on assets and net profit margin are traditionally in the double digits, and expectations are that the growth and financial performance will continue for the next several years for this supplier of dp services for hospitals.

The big question mark on the horizon is the effect of new federal regulations on medical spending. Medicare reimbursement rates for hospitals will be under a new program with set rates, and hospitals will have to have a better handle on their costs and patient mix. So on the one hand SMS's customers are being forced to cut costs, such as dp spending, while on the other hand the only way hospitals will be able to control the money is with more dp. Taking advantage of the situation, SMA introduced a number of new software packages to help its current and new clients manage their finances.

In addition to its timesharing of data processing for medium-sized hospitals, the company has become a value-added reseller of IBM PCs and other desktop units, adding its financial and resource management software to offer a less expensive networked system for smaller hospitals.

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GENERAL INSTRUMENT CORP.

1775 Broadway
New York, NY 10019
(212) 974-8700

General Instrument bottomed out last year, smarting from the beating it took when video games turned into horror shows and small home computers stopped going home with consumers. Sales of the components it made for these industries plunged. And the scaled-back plans of CATV suppliers hurt General Instruments' sales of its newest generation of addressable cable tv converters. Also, volume shipments of new memory and telephone dialer chips fell behind schedule. Startup costs on new products were higher than management had expected. In a year of widespread economic recovery, General Instrument's corporate revenues dropped from $1 billion to $891.7 million, a fall of over 10%. The bright spot, however, was dp revenues, up almost 23% from 1982's $163 million to $210 million last year.

The company sees a return to the company's past growth pattern in the coming year, but some problems remain despite cost cutting and the introduction of new products. The new components—for the automobile, personal computer, and telephone industries—upon which it is banking for renewed growth won't produce the fat margins that video game and home computer chips engendered. Problems with volume production were also rumored at one of GI's two new semiconductor plants.

Good news for the company included an extension of its contract with Connecticut's Off Track Betting, a deal valued at more than $60 milllion. (GI also has high hopes for its Teletrack data system if, as is expected, California okays off-track betting this year.) GI also continued its winning ways in the state lottery business, installing a multistate central processing center in Augusta, Maine, from which it handles the lotteries of Maine, New Hampshire, and Vermont.

Aquisitions of Charter Data Products and, in late '82, Energy Management Corp., and the increase of its investment in Sytek Inc. also revealed the company's beefed-up dp plans for local area networks, the expansion of its bank-remittance processing, point-of-sales systems, and microprocessor-based energy control.

In 1983, GI continued to be the world's number one producer of ROMs, and also leads in EPROMs. Its microelectronics group is investing heavily in speech synthesis and recognition: when better news is reported about this company's turbulent bottom line, one of its own products may well speak the lines.

57

PARADYNE CORP.

8550 Ulmerton Rd.
Largo, FL 33540
(813) 530-2000

The embattled Paradyne Corp.'s 1983 net income plunged 23.2 million to $3.6 million, as compared to 1982 net income of $26.8 million, in the wake of its legal problems with the Securities and Exchange Commission. Revenues barely broke even, inching up a little more than a million dollars to $208.9 million.

"Paradyne experienced a difficult year," says Robert S. Wiggins, chairman, president, and ceo of the company, in summing up Paradyne's woes.

Paradyne cited "substantial" legal costs in defending itself against the SEC allegations filed in federal court that the company was putting its own labels on another company's computers in its efforts to obtain a $100 million contract from the Social Security Administration for 1,850 microcomputers. Paradyne got the contract, but though the company denies any improprieties, it also got a peck of trouble.

Management said it spent more than $2.5 million on outside legal counsel during the year. According to the company, these fees represent payments incurred defending itself in the SEC action, as well as against subsequently filed private actions and "collateral matters."

A bright spot in the midst of Paradyne's legal problems appeared when it reported its one-year backlog of unfilled orders, due for shipment in 1984, had a purchase value of $147 million, up from the $134 million backlog reported a year ago. The company also upped its sales force to 245 persons in the United States during 1983, and made several organizational changes in its upper management.

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EXXON CORP.

1251 Avenue of the Americas
New York, NY 10020
(212) 398-3093

Life was somewhat crude at the world's largest oil company last year. Things were more refined at its Exxon Office Systems (EOS) subsidiary, though.

Exxon Corp.'s revenues fell 9.4% to $94.59 billion. Remarkably, net income posted an impressive 19% gain, reaching $4.19 billion. Contributing to that performance were EOS and Exxon Corp.'s other electronics businesses, known as "other operations" within the corporate conglomerate. These have rebounded nicely from a $48 million loss in 1981.

DATAMATION estimates that EOS's sales were $200 million last year, a 17.5% increase over 1982. While Exxon refuses to provide figures, it is quite likely that EOS is still losing money.

EOS hopes to become a winner through a number of new products. The 3270 Emulation software enables any Exxon 500 Series workstation to emulate a 3270 terminal, using a third-party protocol converter that can support either bisync protocols or Systems Network Architecture (SNA) protocols. WP-CP/M Integration software allows users to transfer files bidirectionally from word processing mode to CP/M mode. The Legal Administrator Applications Program should make life easier for attorneys. The 210 Intelligent Typewriter led off a 200 Series family in which the high-end 220 will eventually offer a 32-character display and 12Kb to 36Kb of memory.

Exxon was busy on the legal front as well. Its Zilog subsidiary, maker of the successful Z-80 chip, the System 8000 supermicros, and winner of major contracts from Commodore and the Internal Revenue Service during 1983, filed a complaint with the

International Trade Commission alleging patent infringement and unfair import practices by Nippon Electric Co. (NEC). Separate suits in Philadelphia and South Carolina charged employees of Exxon Enterprises, parent of EOS, with stealing trade secrets.

Life may get a little cruder this year.

59

M/A-COM

South Ave.
Burlington, MA 01803
(617) 272-9600

Reorganization was the news at this mini-conglomerate last year. M/A-COM's 21 operating companies were consolidated into eight operating divisions. The company sold its optical fiber cable business and its microwave point-to-point business. And Richard T. DiBona posted yet another title on his door: he's now billed in the annual report as "chairman of the board of directors, president, and chief executive officer."

Inspiration for these moves is evident in M/A-COM's numbers, none of them terribly cheerful, especially for a company that's grown used to mammoth annual jumps in both sales and profits. Total corporate revenues for calendar 1983 rose just over 7% to $654.4 million from $610.9 million, but profits were down slightly, dropping to $30.3 million from '82's $30.8 million. DATAMATION estimates that M/A-COM's dp revenue, all of it earned in data communications, stayed flat at about $200 million for the year.

Wall Street analysts seem to think the bad news is over. One Texas brokerage told its customers to buy M/A-COM stock, predicting its earnings will jump by 45% this year, based on the economic recovery and on the company's extensive product line.

The last quarter of 1983 seemed to back up the most optimistic forecasts: it was the best first fiscal quarter in the company's history, with sales of $168.5 million, up 11%, and orders of $179.2 million, up 28% over the previous year.

More good news came just after the new year when M/A-COM was named program manager, systems architect, and systems integrator of a satellite-based, high-speed facsimile network for Federal Express.

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PHILIPS INFORMATION SYSTEMS INC.

4040 McEwen Ave.
Dallas, TX 75234
(214) 386-5580

Like many other conglomerates now in the dp business, Philips is confusing to outsiders. The fourth largest electronics firm in the world, with revenues exceeding $16 billion, it has a worldwide dp presence of about $1 billion, including $200 million in 1983 revenues in the U.S. The parent company, Philips N.V., is headquartered in the Netherlands, but it has offshoots everywhere.

U.S. entities, such as Ludwig drums, Sylvania television sets, and Carolina bus routes, are owned by the North American Philips Corp. The parent owns 59% of the stock of this operation, but it is held in escrow at a Connecticut bank. Then there is Philips Kommunikations Industrie AG, a German company 70% owned by the Netherlands Philips, which in turn owns a U.S. dot matrix printer business, Philips Peripherals. Then there is the Canadian based Philips Information Systems Ltd., an OA company with a large U.S. sales subsidiary that had 1983 sales of $200 million, or about 20% of the estimated total worldwide dp revenues of Philips N.V. and its assorted interests. Philips is included in the DATAMATION 100 on the basis of this subsidiary's revenues.

Last year the Netherlands parent started to consolidate its U.S. operations, with Philips Information Systems, located in Dallas, taking control of the printer business. An intriguing part of the new U.S. operation is its optical disk storage subsidiary, Megadoc, which last year introduced an office equipment version of the consumer video disk system developed by Philips N.V.

61

SANDERS ASSOCIATES

Daniel Webster Highway S.
Nashua, NH 03061
(603) 885-4321

Investors have made a lot of money playing the stocks of this defense contractor and computer graphics specialist. Sanders' 1983 revenues and profits suggest that the news from Nashua will continue to be good. Last year's revenues were up 32%, rising to $646.5 million from '82's $487.8 million, and the profit picture was even prettier, with earnings of $42.6 million, up more than 44%.

Sanders' presence in the dp business dates from 1980 when it bought Calcomp, a builder of computer graphics systems. For the first couple of years, the purchase didn't pay off. The product line was mature and competition was heavy, particularly from Hewlett-Packard. But new products, a profitable arrangement with IBM, and intense cost-cutting are making the picture brighter.

Two new belt-bed plotters, the 945 and the 965, are doing good business, and the graphics terminal Sanders makes for IBM, the 3250, has also sold well as it nears maturity. Sanders is phasing in a new, interactive graphics terminal for IBM, the 5080. Sanders' IBM business accounts for about 13% of sales and 28% of operating profits, leaving it vulnerable to possible IBM in-house production or margin pressure. As has proved true so often before, an IBM imprimatur has meant sales to other vendors as well. For example, shipments of Sanders' Talos digitizer tablet picked up when it was chosen for the 5080.

The improvement in the building business has also meant good things for Sanders: sales of architectural, construction, and engineering end-user graphics devices are running ahead of projections.

62

INFORMATICS GENERAL

21031 Ventura Blvd.
Woodland Hills, CA 91364
(213) 887-9040

Informatics had a mixed year in 1983, with software products performing very well and timesharing services declining. Overall, the company's revenues rose 16% to $197.9 million, with net income jumping 57% to $8.5 million. Revenues from dp totaled $150.5 million, up 17% from 1982. Software products revenues climbed 34% to $90.8 million, with net income before taxes for those products climbing 49% to $5.2 million. Timesharing revenues dropped negligibly from $60.3 million to $59.7 million, and income before taxes fell 18% to $3.3 million. While corporate net income jumped, employment grew more slowly, an 8.5% rise to 2,822.

These numbers are a result of Informatics' continued marketing of a range of cross-industry and vertical market products and timesharing services. The cross-industry products, such as the Mark IV and Mark V batch and on-line program development products and the Answer/DB database management system, represent an older, declining portion of the business. Revenues for these types of products and services fell 2% to $95.1 million, and net income before taxes fell 35% to $4.4 million. Informatics developed a micro-mainframe connection in conjunction with VisiCorp during the year, providing a gateway to Answer/DB databases from VisiCalc.

The vertical markets areas are booming. Revenues for these products and services hit $100.4 million, a steep 35% increase over 1982. Income before taxes jumped off the scale, a 121% leap to $8.2 million. The company's offerings in the accounting, legal, and insurance fields grew 70%, 54%, and 45% respectively during the year.

Even while reaping the rewards of the current generation of vertical market software, Informatics was preparing for the next generation, kicking in $7.4 million toward R&D in 1983. That represents a 27% increase over the amount spent in 1982 and 4% of 1983 corporate revenues.

63

CPT CORP.

8100 Mitchell Rd.
Eden Prairie, MN 55344
(612) 937-8000

CPT Corp.'s growth in 1983 was less dramatic than in previous years, yet the company did post gains in both revenues and income. Revenues from its line of office automation equipment were up $30 million to $192 million. Net income increased 12% to $17.7 million.

Even though revenue and income were up, the company categorized FY '83 as "difficult, yet extremely productive," adding it was pleased with its growth despite the weak worldwide economy and the strong U.S. dollar abroad.

To improve its trading position in Europe, the company opened a manufacturing facility in Ireland. CPT says its manufacturing and distribution costs have been lowered since it opened the technical support center in County Cork.

During 1983, the company introduced more new products than in any previous year, but it reports that inventory levels did not increase significantly from 1982. One product it introduced was the Dialog system, a shared intelligence network that allows a large number of workstations to share information. Dialog includes mass storage, database management, teletext, electronic mail, scheduling, and calendaring.

Last April, the company introduced two shared resource systems, the SRS 40 and SRS 65. According to the company, these systems offer cost-effective solutions when central mass storage is required for two to 16 workstations.

CPT says it is stepping up its research and development efforts. Last year the company spent $9 million, an increase of 34.3% over 1982.

64

DUN & BRADSTREET CORP.

299 Park Ave.
New York, NY 10015
(212) 593-6800

Like many other old-line publishers, Dun & Bradstreet continued its rapid move into the information processing market last year. Fresh from the recent acquisition of McCormack & Dodge, coupled with D&B's computer-related revenues from National CSS, the company's total dp revenues soared in 1983. Much of the success was due to M&D's mainframe software products.

The company reports that dp revenues exceeded $177 million, up 40% from the $132 million recorded in 1982 (after subtracting the 4% of revenues derived from other parts of the broad-based supplier of business information services.) The parent company had 1983 revenues of $1.6 billion and net income of $167 million, up 11% and 18%, respectively.

Other parts of D&B's dp-related business didn't fare as well. The company reported that NCSS, now known as D&B Computing Services, "suffered a decline in revenue, reflecting industry-wide contraction in the timesharing business." Competition from inexpensive micros was cited by the company for the decline. In response, D&B Computing cut its overhead and introduced some new products.

DunsPlus was unveiled as the alternative to the user-surly nature of most micro-to-mainframe and micro-to-database links. The company became a value-added remarketer of the IBM PC and the 1-2-3 integrated software package from Lotus Development Corp., and together with D&B databases and other software, created the "most user-friendly system in existence," the company claims.

M&D's recently introduced Millennium series of mainframe software packages for payroll and accounting did well in the market, and the company announced its Interactive pc link for uploading and downloading mainframe and pc data.

65

DYSAN CORP.

5201 Patrick Henry Drive
Santa Clara, CA 95050
(408) 988-3472

Last year Dysan made a lot bigger profit in the stock market than it did in its real business, rigid and floppy disk storage. It sold about 4 million of the shares it held in Seagate and realized a net gain of $41.22 million. After the sale, Dysan still owns 13% of Seagate, about the same size as the chunk it sold. It is a vivid reminder of how much a smart investment can appreciate in an industry like dp: all of Dysan's Seagate shares had cost it only $450,000.

Meanwhile, back at Dysan's disk business, news was okay but not thrilling. While revenues for the year were up more than 27% to $180 million, profits—discounting the enormous contribution from the Seagate sale—were off from 1982's $9 million.

President and ceo William L. Harry said the windfall from the Seagate deal will be used to finance the further expansion of Dysan's "disk business and the activities of our seedling affiliates."

Indeed, expansion seems to be what Dysan is up to these days. Abroad, the company opened a software duplication and translation facility in Belgium, a distribution center in the U.K., and a new sales office in West Germany. At home, the company says, "We currently have two additional facilities under construction in Santa Clara and are planning to build two manufacturing facilities on our property in Colorado Springs, Colo."

This growth doesn't come cheap. Nor does the R&D that's required to stay ahead of the pack, and Dysan is expected to continue spending between 15% and 20% of its revenues on R&D.

While revenues will undoubtedly rise in the growing—by 30% annually—disk market, it's expected that Dysan's profits won't begin to show the same improvement for a couple of years.

66

INTEL CORP.

3065 Bowers Ave.
Santa Clara, CA 95051
(408) 987-5090

The year 1983 marked two firsts for Intel Corp. It was the first time total corporate revenues exceeded the billion dollar mark and the first time this company has appeared in the DATAMATION 100.

While total corporate revenues registered $1.12 billion, up from almost $900 million in 1982, total dp revenues were also up $35 million to $175 million. Peripherals and terminal revenues were $125 million, and software and services revenues made up the additional $50 million.

The economic recovery reached Intel by midyear, and the company was able to start phasing out the pay cut and freeze that had been in effect since January 1983.

As the demand for Intel's chips soared, corporate annual revenues grew by 25% and operating profits increased nearly fivefold from the company's depressed 1982 levels. In addition, interest income increased by over $28 million, resulting in net income increasing nearly fourfold and earnings per share more than tripling to $1.05. In the fourth quarter, revenue was up 39% over the previous year.

But such a strong and positive change in business conditions did bring problems for the company. Part of the growing pains had to do with difficulties in producing product fast enough to meet demand. To counter this, the company's work force and facilities are being expanded.

During the year, Intel introduced the Systems 86/310 and 286/310, single-board processors based on its 8086 and 80286 microprocessors, and the iSBC 186/51, a single-board computer offering both the computing power of the 80186 and the local area network control capability of the 82586. Also new was the Xenix operating system for the 80286 microprocessor, and the company announced that a version of the Unix System V operating system would be available for the 286 in 1984.

67

CONTINENTAL TELECOM INC.

245 Perimeter Center Parkway
Atlanta, GA 30346
(404) 391-8000

Contel didn't wait until Jan. 1, 1984 for the breakup of AT&T. Back in 1978, the company realized big changes were ahead for the telephone industry and it began diversifying into other industries. Contel made a number of aquisitions in the data processing industry that added to the company coffers in 1983. Out of the total corporate revenues of $2.1

billion, only $174.7 million comes from dp, but Contel is happy with the profit margins, and is introducing a number of new products for the industry.

Cado, acquired in 1983, was responsible for $53.5 million in dp sales, up from the $33.7 million of 1982. Cado's profits weren't individually released but Contel claims office automation vendor Cado has gone from a loss to a profit. During the year, Cado introduced the Tiger family of multiprocessor 16-bit supermicros, which can handle 64 users. Contel expanded Cado's manufacturing facilities—as well as beefing up R&D—with two new manufacturing facilities in 1983, one in Torrance, Calif., and the other in Cork, Ireland.

Other Contel acquisitions in the dp market include STSC Inc., the large supplier of remote services and software products, and NaBanco, a credit card-checking company in the remote processing services market. In addition, International Computing Co. and Network Analysis Corp. were acquired and joined together to form Contel Information Systems. These various software operations added up to $105.3 million in revenues for 1983.

A new dp revenue producer is expected next year, when Executone, purchased in 1978 by Contel as the first step to diversification, produces a planned line of digital PBX systems for the small business market. Executone is already a prime supplier of telephone gear, with $178 million in 1983 sales.

Contel is proud of the fact that 31% of its total revenues and 10% of net income come from nontelephone operations. The company plans to expand these figures even further, toward its goal of 35% of revenues and 25% of earnings.

As the telephone industry remains in turmoil, Contel is able to post higher earnings and still keep an eye on what the FCC is proposing to do about access charges. While the 10% earnings appear small, they loom large when compared with Contel telephone operations earnings, which grew only 2.5%. The nontelephone operations are already an important factor for Contel, one the company will no doubt support and nurture.

68

CRAY RESEARCH INC.

608 Second Ave. South
Minneapolis, MN 55402
(612) 333-5889

Cray Research set company records for system deliveries, revenue, and earnings in 1983. Revenues for the year hit $169.7 million. Net earnings grew 37% to $26.1 million.

During the year, the firm installed 16 new systems worldwide, bringing the number of its supercomputers in operation to 65. Of the 16 systems, six were Cray X-MPs. By the end of 1983, Cray was shipping one X-MP a month. The company says the X-MP, which carries a price tag in excess of $10 million, has become the "financial engine of the company."

During 1983, Cray received orders for 25 systems. Of the 25 contracts, 12 were from new customers, and 10 of those were commercial accounts. Almost half are first-time supercomputer users. Of the remaining 13 contracts signed by existing customers, nine are for the X-MP.

Research expenditures declined $3.2 million to $25.5 million—roughly the same percentage of the total budget the company spent on R&D in 1982—despite challenges from national programs in Europe and Japan that are developing large-scale computers and the technology to support them. Furthermore, cooperative programs and consortia have been established in Europe and the U.S. to develop supercomputers, and new companies are entering the field regularly.

To counter these supercomputer challenges, Seymour Cray and his design team produced their first gallium arsenide devices at the company's new fabrication facility in Chippewa Falls, Wis. Cray's other developments were in the software area. The company released a new version of its COS operating system and selected Unix as the operating system for the Cray-2.

69

TELEVIDEO SYSTEMS INC.

550 E. Brokaw Road
San Jose, CA 95131
(408) 993-1320

TeleVideo had a great year in 1983; it increased revenues 71% to $168.7 million, up from $98.5 million in 1982. In addition, TeleVideo had a whopping earnings increase as well, which few Top 100 companies were able to match. Earnings were up 76% to $22.4 million, from $12.7 million for the previous period.

TeleVideo was able to post these all-time high earnings and revenues figures at the same time that it was broadening its traditional marketplace and entering a whole new market. At the end of 1982, TeleVideo was a leader in the terminal market, but by the end of 1983, it was a force to be reckoned with in the pc market through its TS 800 workstation and TS 804 multi-user system.

In the middle of the year, TeleVideo changed from the operating system CP/M standard to IBM's PC/DOS, which it recognized early on as the standard operating system for pcs. This enabled the company to grab a large volume of sales through an all-important connection with Computerland.

TeleVideo financed this growth with an initial public offering in early 1983, netting $91 million. The year saw the number of employees grow 77% to 867. Research and development was a high-priority item, growing 123% to $6.9 million. A number of steps were taken to expand capacity during the year, including the purchase of a plant in Korea for pc manufacturing.

Dr. K. Philip Hwang, chairman, has an eye for the future, including smart telephones and other data retrieval devices for the executive's desktop.

70

BASF SYSTEMS CORP.

Crosby Drive
Bedford, MA 01700
(617) 271-4000

The company that invented magnetic tape in 1934 continues to be a leader 50 years later. BASF pulled in $165 million from magnetic media in 1983, according to DATAMATION estimates. BASF markets a full line of media for large and small systems, including disk packs, cartridges, and computer tape for mainframes and minis, as well as floppy disks and tape cartridges for smaller systems.

The company has increased its emphasis on using resellers rather than dealing directly with even large customers. Currently, more than 50% of all the company's magnetic media products are sold through its authorized reseller network.

BASF's products are manufactured in three facilities around the world. The U.S. headquarters in Bedford uses specialized quality control procedures to ensure product uniformity and performance. The $16 billion corporation spends about $200 million a year on research and development in magnetic media, most of which goes into the dp industry (Some goes into audio- and videocassettes and tapes for consumer and entertainment industry use.)

BASF's primary dp business is still magnetic tape. It currently sells two lines, the Endura and the 2000 AD. The 2000 AD line is essentially a premium quality Endura, selected only from custom lots and certified reel by reel to be error-free at 75% higher tolerances than tape drive requirements. The disk business, especially the FlexyDisk floppy disk segment, has been growing rapidly in the past few years, owing to the rise of micros.

71

CENTRONICS DATA COMPUTER CORP.

One Wall St.
Hudson, NH 03051
(603) 883-0111

This well-established printer company found 1983 a disappointing year, despite having reduced substantially its operating losses and repositioning itself to address broader markets. Centronics made efforts to reassert itself in the oem markets, particularly for low-end matrix printers, where it has lost much ground in recent years.

Centronics' sales for 1983 were $164.1 million on which the firm reported a loss of $7.7 million. The previous year's loss had been $32.3 million from revenues of $138.4 million. The firm attributed much of the poor showing in 1983 to high costs. To rectify matters, Centronics last year established a new centralized management structure, began investigating the procurement of subassemblies in the Far East, where labor and materials are cheaper, and began redesigning its own manufacturing facilities to take advantage of automated techniques. It also reduced employment to 1,700 from 2,000 people.

Centronics also introduced new models of its Linewriter band printer family and unveiled a new series of low-cost matrix printers, the Horizon line. The former is aimed at oem customers that tend to make lengthy evaluations of products and therefore are slow to make commitments to large volumes. The Horizon line is aimed at small systems and personal computer applications and complements the firm's Printstation line of matrix machines. In both arenas, however, the company faces stiff competition from Japanese and other foreign suppliers. Centronics has, though, continued its relationship with Japanese manufacturer Brother Industries Ltd.

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CONVERGENT TECHNOLOGIES INC.

2500 Augustine Drive
Santa Clara, CA 95051
(408) 727-8830

Despite the fact that Convergent Technologies' sales increased $70 million in 1983 to $163.5 million, operating income decreased to $11.9 million from $18.2 million in 1982.

The company attributed the decrease in income to a general pricing decline in the workstation market and the price reductions of its AWS and IWS workstations during the second half of 1983.

While sales were up for the entire year, sales growth slowed because there were fewer orders than expected from the company's larger oems. They reduced purchases of the AWS and IWS products during the second half of the year in anticipation of CT's new workstation, the N-Gen.

Last year also saw CT stray from its original niche as a manufacturer of desktop computers and roll out MegaFrame, a processor that can be upgraded from an eight- to a 128-user superminicomputer. By the end of the year, orders for the MegaFrame were ahead of company projections. Another new product was WorkSlate, a lap computer.

CT began shipping limited quantities of N-Gen, but shipments of the product were below expectations and costs higher because of a slow manufacturing start-up and an inability to obtain parts from Intel.

A significant event that occurred in the final days of 1983 was the announcement that AT&T Information Systems had awarded CT a contract to design, develop, and manufacture certain products in the wake of the communication giant's decision to enter the general purpose computing arena.

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DIEBOLD INC.

818 Mulberry Rd. S.E.
Canton, OH 44711
(216) 489-4000

"Easy Money" ought to be the motto for this company, which at one time was run by Eliot Ness of *The Untouchables* fame. The 125-year-old company is the largest builder and seller of automated teller machines, with more than 6,000 units shipped last year, or almost half of total U.S. shipments. The cash machines have proved to be a boon to banks, brokers, gas station operators, and other retailers. Diebold's revenues, profits, and operating ratios are at the peak of their form, despite competition from archrival Docutel as well as from IBM, NCR, Burroughs, and a host of other computer companies.

Total revenues were up 4% to $446 million, and net income jumped 18% to $49.1 million. DATAMATION estimates dp revenues were up a modest 6.7% to $160 million, representing the revenues from its ATMs, which are really peripherals attached to a bank's mainframes.

To keep on top, Diebold boosted research and development spending 76% to $24 million, most of it going to hardware and software development to keep its line of teller equipment, both automated and manual systems, state of the art.

Diebold rolled out several new products late last year to encourage its customers to replace units as the ATM market matures. The new ATMs are geared for self-service locations in supermarkets and other retail locations. A new desktop microcomputer line was also introduced to broaden Diebold's profile in the bank automation business.

Diebold as a company was stunned by the sudden death in February of this year of its president and ceo, Earl F. Wearstler, after a short bout with heart disease. He had been a 37-year veteran of the company and had only recently attained the ceo title. In early 1984, Robert Mahoney was named president.

74

THE SIGNAL COS.

11255 North Torrey Pines Rd.
La Jolla, CA. 92307
(619) 457-3555

Most of Signal's $160 million in data processing revenues comes from its Ampex Corp. subsidiary in Redwood City, Calif. While Ampex's main business is manufacturing videotape recording equipment and media, its Computer Products Division also supplies crt terminals, core and semiconductor memory systems, and Winchester disk drives and related media.

While Signal's revenues for 1983 were recorded as $6.15 billion, up from $3.73 billion, most of this growth was due to the 1983 merger with Wheelabrator-Frye and to an accounting change. Net income from the merged entity dropped to $103 million from 1982's $113 million. DATAMATION estimates that total dp-related revenues dropped to $160 million from $177.3 million.

Last year saw Ampex begin full-scale production of Winchester disk drives ranging in capacity from 6.7MB to 27MB, and an increase in shipments of fixed-removable disk drives in the 165MB to 330MB range. The company installed a new automated thin-film disk platter production line that is expected to turn out more than 1 million oem units this year.

Meanwhile, Ampex's crt terminal business, with manufacturing based in Taiwan, expanded its product line with a low-priced family and a series of multiprotocol workstations developed by ECS Microsystems, which was acquired in 1983. The Computer Products Division also hired a new general manager last year, who it hopes will help the company reverse its sales slide.

75

GERBER SCIENTIFIC INC.

83 Gerber Road West
South Windsor, CT 06074
(203) 644-1551

As the U.S. economy picked up, so did Gerber Scientific's fortunes. The company, which is a specialist in CAD/CAM production, had a hard time in 1982 when the economy soured. But as the economic clouds cleared, Gerber was able to post increased revenues and earnings. Revenues increased 38.7% to $159.1 million in calendar 1983, up from $114.7 million for the previous period. Net income was up a spectacular 222% to $11.3 million from $3.5 million in 1982.

The CAD/CAM market is set for explosive growth and is expected to become a $4 billion market by 1986. Gerber is uniquely poised to make the most of this growth. The company is divided into four operating subsidiaries, each geared toward a particular market. In addition, Gerber established a venture capital subsidiary during 1983 to help it invest in emerging companies.

The largest operating subsidiary is GSI, aimed at the electronics and graphic arts industries. The mainstay of this subsidiary is the PC-800 model 13, which aids in the design of printed circuit artwork and the manufacturing of tooling and documentation. Another GSI product is the task-oriented AutoPrep 5000, developed to meet the graphic arts industry's need for fast response and high quality.

Gerber's main effort in the CAD/CAM market has been with its GGT subsidiary, which specializes in the designing, grading, and cutting of flexible materials from fabrics to composites at high speed with great accuracy. The backbone of this operation is the GERBERcutter, which has increased production 300% at some locations.

76

MARTIN MARIETTA CORP.

6303 Ivy Lane
Greenbelt, MD 20770
(301) 982-6500

Martin Marietta knew it had a good thing in its Data Systems Division. It was such a good thing that the giant conglomerate decided to spin it off into a separate operation—Martin Marietta Data Systems (MMDS)—four years ago. Attesting to that success is MMDS's data processing revenues, which reached $154 million, a 23% jump over last year.

Most of that revenue stems from the software side, where MMDS pulled in $116 million, a 35% increase over 1982. The company offers timesharing services and a range of off-the-shelf and customized software. Particularly strong in the application software area, MMDS markets the popular MAS (Modular Application Systems) software, which has gone over big in the manufacturing industry.

To bolster this software strength, Martin Marietta acquired Mathematica Inc. last year for $30.8 million plus securities. The software house, which chalked up a net operating revenue of $36 million in 1982, was melded into the MMDS operation.

Mathematica was quite a catch for MMDS. The company's RAMIS II is the industry's leading fourth generation language, with over 500 installations. It operates on either IBM or compatible machines, using a variety of operating systems. Mathematica's other operations include Mathtech, which is involved in the development of packaged software and the sale of software-enhanced micros, and Mathematica Policy Research, a market research and consulting group specializing in formulating state lottery systems. Mathematica had a number of suitors, but opted for the MMDS offer because of the broad financial base it offered.

Also in 1983, MMDS bought American Management Systems' suburban Washington data center. The company now has three data centers in operation. Setting its sights on the future, MMDS is currently experimenting with new teleconferencing techniques, optical memory, fiber optic networking, large-scale database integration, and robotic simulation.

77

QUOTRON SYSTEMS INC.

5454 Beethoven St.
Los Angeles, CA 90066
(213) 827-4600

Quotron's terminals can be found in the offices of most money managers and Wall Street research analysts, scrolling the latest stock quotes and investment information. The omnipresence of Quotron in the instant financial data market combined with high volume on the nation's trading floors has meant continuing growth for this company.

Last year, Quotron's revenues increased by just over 27% to $153.8 million, and net income rose by 41% to $23.98 million. Also increasing was the number of employees, to 1,425 from 1,164 in 1982. But Quotron's hold on its markets is being threatened. Big customer Merrill Lynch—accounting for about 25% of Quotron's current revenues—is developing its own system with Monchik-Weber. It will use IBM 3270 PCs as terminals, allowing Merrill Lynch customers to call up quotes on their own machines.

Increased competition is also coming from the other data services, ADP and Allied Corp.'s Bunker-Ramo Information Services. Observers say that Quotron's future growth will come in the banking and thrift industries, shielding the company somewhat from the effects of any Merrill Lynch action. Nevertheless, investors have proved wary: while it still sells at a hefty price/earnings ratio, Quotron's stock has not recently approached the high of 32 it posted last summer.

To further counter these threats, Quotron has turned up the R&D flame. In 1983 it spent $10.8 million, up from $7.3 million the year before. Some of this money was spent on a new line of products, Quotron 1000, that will deliver a rich menu of office automation features as well as financial data.

For the latest on this company, keep your eye on the screen of one of its own products.

78

WYLY CORP.

UCC Tower
Exchange Park
Dallas, TX 75235
(214) 353-7100

One of the staples of recent business journalism has been the story noting the recovery of this services, software, and turnkey system vendor.

Following a string of disappointing years that included a bankruptcy in 1976, and after a glum 1982 for which the company posted losses of $7.8 million on sales of $140.5 million, Wyly actually earned some money in 1983. Not much to speak of, but enough to suggest to the financial community that the new management installed in 1983 might finally get this company shaped up: about $200,000 on revenues of $153 million.

The company put some new software on its menu, closed some unprofitable operations, cut costs, and—as *Value Line* reported—"spruced up the balance sheet."

Problems continue, however. Wyly's computer services operation in the United Kingdom remains awash in troubles, and Digital Systems in Florida hasn't performed as hoped.

The improving news includes a big chunk of cash on hand, the result of more money recently kicked in by the company's largest stockholder, the Swiss-based Careal Holding, and the successful sale of 2 million shares of common stock in April 1983. Wyly will use this $40 million kitty to expand its software offerings through beefed up R&D—almost doubled in '83 to $9.9 million—and by acquisition.

In September, Wyly bought Open Systems Inc. for $15.5 million. The Minneapolis-based firm writes accounting software for microcomputers, further strengthening Wyly's hand in its bid to be an across-the-board dealer of financial and accounting wares.

If things keep on improving Wyly can use its own improved performance to advertise the goods.

79

ALLIED CORP.

Columbia Rd. and Park Ave.
Morristown, NJ 07960
(201) 455-2000

Buried beneath the $10 billion in Allied's annual revenues are several computer businesses, though the crush of natural resources and basic manufacturing operations tend to hide the fact. Several years ago Allied bought Bunker Ramo, a dp hardware, software, and services vendor that has been falling on hard times. DATAMATION estimates that total dp revenues were up slightly in 1983, to $152 million from the $147 million of the prior year. According to Allied, BR's operations were "marginally profitable" last year, not much to say for a business that cost Allied $347 million in 1981.

Any disappointments that BR management felt last year were due to the rapid technological changes taking place in the financial services industry as well as those in the dp worlds.

BR's basic businesses—terminal hardware and software for banks and brokerage firms—were buffeted by the trend to replace dumb terminals like the aging BR line with personal computers. BR tried to stay competitive but its new workstations just didn't provide the IBM PC capabilities and features that end users wanted.

The on-line information business, stock quotes and the like, that BR supplies to brokerage firms also changed from a leisurely business to a cutthroat arena. GTE sold out to ADP, and Quotron was threatened with the loss of its biggest customer, Merrill Lynch.

BR's moves to prepare for the future included increased spending on research and development and a joint venture with Fortune Systems, a Silicon Valley firm with an advanced personal computer. Fortune's fortunes faded fast, however, when the software for its 32:16 workstation proved unreliable. Allied has gone back to the drawing board, looking for a quick fix to its pc needs.

80

VERBATIM CORP.

323 Soquel Way
Sunnyvale, CA 94086
(408) 245-4400

Verbatim ended 1983 on a profitable but cautious note. Revenues were up 45% to $147 million from the $98.6 million reported a year earlier. Earnings also increased rapidly, to $15 million from the $11.5 million of 1982. These figures, however, hide the dismal performance in the fourth quarter of 1983: earnings fell 25% from last year's $2.8 million. Verbatim explained the poor performance on order softness from oem customers and a large product return from a major oem customer.

All during 1983, Verbatim battled such problems, but this versatile producer of floppy disks managed to prevail. The competition in the disk market became tougher, and Verbatim moved on a number of fronts to increase its market share. First of all, to round out its product line, Verbatim introduced its Optima series, which is used on high-performance micros like Apple's Lisa.

Verbatim then moved its products into the consumer market by signing 2,000 national chains like Computerland and Macy's. In addition, Verbatim increased its advertising budget and appeared in consumer publications like *Time* and *Cosmopolitan*.

Another Verbatim effort at the consumer market was the introduction of the Disk Drive Analyzer, which evaluates drive head media positioning, drive hub clamping operation, drive speed, and data storage accuracy. This is the first product from Verbatim's Data Encore subsidiary, which is exploring the software duplication market for future products and profits.

Verbatim realized that with success comes competition, and in response pushed its R&D budget up almost 50% to $11.5 million. Meanwhile, Verbatim is cutting corners in other areas, like layoffs of production workers, to control costs. With personal computer sales continuing their sizzling pace, the lean, mean Verbatim is ready to fight for the flow of user dollars.

81

MANAGEMENT SCIENCE AMERICA INC.

3445 Peachtree Rd. N.E.
Atlanta, GA 30326
(404) 239-2000

In the last few years, MSA has blossomed from a mainframe-focused, privately held company into a software-for-everything, sweetheart of the stock markets. But last year, as they say in Wall Street, MSA didn't "make its numbers," and the stock took a drubbing in a down market.

Nevertheless, MSA's sales jumped last year by more than 44% to $145.2 million. (Over the past two years, the increase has been more like 100%.) Income before taxes hit $19.5 million, up 38% over 1982, and net income grew to $10.5 million. The increase in net income was held to a respectable 17% by what the company called a "substantially higher" tax rate, caused by MSA's decision to treat R&D tax credits conservatively.

The overpriced dollar abroad was also a brake on MSA's momentum: the percentage of MSA's revenues that came from foreign sources dropped from 23% in 1982 to just under 21% last year. MSA continued to add products to its lineup by acquiring companies. It entered the educational micro software field, a market that's expected to grow by 70% a year in the near future, when it bought EduWare Services Inc. MSA's purchase of Computeristics Inc. added still more items to the company's menu of IBM mainframe software.

MSA also beefed up its R&D budget in '83, pushing it to $28.9 million, up from $21.8 million in 1982, continuing a trend set the year before when this seed-money budget item also rose by about a third. With R&D costs running at about 20% of gross revenues, MSA seems determined to further reduce its dependence on the unpredictable fourth quarter payoff that results from relying on financial software as its core business.

82

REYNOLDS & REYNOLDS

800 Germantown St.
Dayton, OH 45407
(513) 443-2000

Last year, this venerable company's revenues moved out of the slot where the recession parked them a couple of years ago. DATAMATION estimates that dp revenues grew last year by about 24%, going from $120 million to $145 million. (Reynolds & Reynolds' total revenues, $263.9 million, include its sales of standard and custom business forms, which first led it into the computer services field.)

Most of Reynolds & Reynolds' business has come from the nation's automobile dealers, among the businesses hardest hit by the recent recession. The recovery has been kind to the diminished car business, and by the fourth quarter of 1983, revenues and gross profits from the computer systems division were up by about one third over the fourth quarter of the year before.

Last year also saw the inking of a joint venture pact in Europe with the French Sligos S.A., Paris. Sligos & Reynolds S.A. will sell computer systems to French automobile dealers. Reynolds & Reynolds is also doing business in Australia, New Zealand, the U.K., and South Africa.

In April, the company closed down development of a specialized contractor system, saying that "to continue development of the system in the face of a closing market window would be imprudent." But by the end of the year, management was optimistic about tests of a new medical system, and planned to introduce it in 1984.

The company got itself out of the computer-building business in 1983, dropping its E-6000 and replacing its TC 1000 micro terminal with the IBM PC. Early in '84, chairman and veteran ceo E.F. Strasser stepped down in favor of Terry D. Carder, who had been president and ceo. Strasser, who said ill health forced the move, will remain as chairman and consultant.

83

NIXDORF COMPUTER CORP.

300 Third Ave.
Waltham, MA 02154
(617) 890-3600

Revenues for the American arm of Heinz Nixdorf's computer company stayed pretty flat for '83, with sales totaling $141.1 million, just $1.1 million more than the previous year. The parent company, headquartered in Paderborn, West Germany, came closer to piercing the $1 billion ceiling, with revenues up to $997 million from '82's $961 million.

The mainstay of Nixdorf's business continues to be its 600 product line, launched more than 10 years ago. But buoyed by a 29% boost in R&D spending, the company sent new products flowing into the U.S. and international markets, among them the 8890 midrange computer system, aimed primarily at Fortune 500 companies, and the 8860 network system. Last year, a major bond servicing company installed an 8860 system in 110 banks, and more sites are scheduled. Point-of-sale systems for the retail marketplace, particularly hotels and restaurants, are a major target for Nixdorf, and last year the 8812 POS system made its debut, serving a large California restaurant chain.

Two products announced last year will make it into the U.S. market in 1984, the 88BK voice recognition system and the 8832 fault-tolerant computer. The fault-tolerant system was developed with Auragen Systems Corp., Fort Lee, N.J., and will be sold by both companies. Nixdorf claims "almost 100% system availability" for the 8832.

There was big news, too, from Nixdorf's Richmond, Va., software development outfit, Nixdorf Computer Software Co.: a Unix-compatible timesharing system for IBM mainframes running under IBM's DOX/VS(E) and Nixdorf's own 8890 running EDOS/VS and EDOS/VSE operating systems.

84

NBI INC.

P.O. Box 9001
Boulder, CO 80301
(303) 444-5710

NBI Inc. had a tough year in 1983, a big difference from its performance in 1982. Revenues were up almost $20 million to $140.8 million, but income was down almost $10 million to $3.5 million.

The company suffered a third quarter loss of $3.5 million. It attributed the loss to being caught between product cycles as customers delayed orders in anticipation of new NBI systems. Fourth quarter performance began to recover as the demand for its products increased.

During the year, NBI hired 497 new employees bringing its work force to 1,846. It also completed construction on and occupied its new 250,000-square-foot headquarters in Boulder, Colo.

As part of its expansion program, the company opened four new domestic branch offices for a total of 33 and added 15 new dealer locations for a total of 76. NBI also took control of its key international markets by purchasing distribution rights and operations for its products in Canada, West Germany, and the United Kingdom, and built direct sales organizations in those countries as well.

During the year, this vendor added several new products to its OASys line of office automation equipment. Additions included the 4000 series of ergonomic workstations, the OASys laser printer, and the OASys 64 clustered product and 3270 communications capability.

The company also introduced System One, which includes the integrated workstation and integrated systems server. NBI also came out with a local area network that ties the OASys and System product lines together.

85

PLANNING RESEARCH CORP.

1500 Planning Research Drive
McLean, VA 22102
(703) 556-1000

Uncle Sam is a big favorite with Planning Research Corp., which pulled in most of its 1983 dp revenues by doing business with the Feds. Some glitches in that business, however, caused PRC's overall dp revenue to drop slightly to $136 million last year from $138 million in 1982.

In the dp domain, software/services jumped 26% to $131 million. Meanwhile, the company's turnkey systems trade was off by more than 50%, down to $4.8 million. This diversified services company's total revenues also inched downward to $318 million last year from $321 million in 1982.

Data processing remains the company's biggest revenue earner. During FY '83, the PRC Government Information Systems (GIS) operation hauled in 34% ($108.2 million) of the company's revenues. Approximately 19% came from PRC Systems Services, which posted earnings of $50.4 million—down 6% from 1982. PRC Computer Systems, which sells computer-based multiple listing and other services to the real estate brokerage industry, accounted for 16% of the company's overall earnings in FY '83.

On the acquisition front, PRC broadened its dp base last year by acquiring Sterling Systems Inc., an $18 million computer systems and software company also headquartered in McLean, Va. Officially melded into the GIS group last June, the Sterling Systems subsidiary was a welcome addition to the PRC family. Even more welcome was the $10 million contract the new sub won to provide software services for the Navy's new inventory control systems.

Also last June, PRC formed an R&D limited partnership with E.F. Hutton called Hutton/PRC Technology Partners Ltd. The 30-year-old company hopes to raise up to $25 million through this venture to fund high-tech research and development projects.

An in-house venture was also launched last year between the firm's GIS and engineering groups. These two PRC units have teamed up to form a new organization that will market the company's computer-based systems and services internationally. PRC's initial plunge into the international software market failed several years ago.

This time around, PRC is optimistic about profits on the foreign front—optimism that seems to be fueled by the company's accelerating domestic dp drive.

86

LEAR SIEGLER INC.

2850 Ocean Park Blvd.
Santa Monica, CA 90406
(213) 452-6000

Data processing revenues inched up $2 million for Lear Siegler Inc. in 1983 to $130 million, according to DATAMATION estimates, despite the fact the company reported record sales of computer terminals.

While shipments from the Data Products Division of LSI, one of the largest independent manufacturers of dumb terminals for non-IBM markets, were at a record level, dollar volume was down because of lower unit prices. In fact, profits almost dissappeared due to the industry's rampant price-cutting.

Two new terminals and a printer were introduced in 1983. The terminals are ergonomically designed with detachable keyboards and the monitor has a swivel and tilt mechanism. The multifunctional printer has graphics capability, including full color.

Total corporate revenues were $1.5 billion in 1983, up from $1.4 billion in 1982. As the year progressed, business began strengthening for the diversified corporation as reflected in the third-quarter results, which were about even with the previous year. In the fourth quarter, earnings of $23.8 million represented a 14% improvement over 1982.

Research and development revenues were $30.9 million in 1983 as compared with $28.5 million in 1982. According to the company, R&D expenditures are at record levels, and new product development and support of existing products are up companywide.

87

BRADFORD NATIONAL CORP.

67 Broad St.
New York, NY 10004
(212) 530-2400

For better or for worse, 1983 was certainly an active year for Bradford National. The most important events were those concerning the proxy fight waged in the spring by dissident shareholders for control of the company's board of directors. That fight began when William Siegel, ceo of Siegel Oil Co. and a big holder of Bradford stock, formed a group claiming that Bradford was not taking advantage of opportunities in the financial services industry. Bradford sued, then said it would seek a buyer if Siegel's group would back off. Ultimately, however, Siegel's group held sway. Siegel was named the new chairman of the board and two new directors were named, giving Siegel control of the board, which then named Alan C. Winters to replace Roy B. Simpson as president and ceo.

Through it all, Bradford's business continued to suffer. True, corporate revenues climbed 7% to $144.4 million and dp revenues rose 10% to $127.4 million, but the $400,000 net income for 1982 turned into an $8.1 million loss. Employment rose 3% to 3,100, and R&D expenses rose 125% to $4.5 million.

The company continues to focus on providing proprietary services to financial institutions, brokerage firms, and governments. During 1983, its unprofitable Bradford Broker Settlement Inc. subsidiary was sold, which accounted for $7.4 million of its total loss on the year. The company also sold its 19% interest in Eagles National Corp. at a loss. Without those two transactions, Bradford would have had a $3.3 million pretax profit on the year.

88

NATIONAL DATA CORP.

One National Data Plaza
Atlanta, GA 30329
(404) 329-8500

National Data Corp.'s dp revenue was up only $5 million to $126 million in 1983. While the first and second quarters were ahead of 1982, third and fourth quarter performance fell below last year's level.

Atlantic Richfield, one of NDC's largest accounts for credit card processing equipment, discontinued its credit card and its account, but according to NDC, this had only a "limited impact on overall performance."

Another significant development occurred in July when NDC agreed to acquire Libra Group Inc. of Rockville, Md., for about 270,000 shares of NDC. Libra is a software development and consulting firm whose primary business is in health care-related government contracts. NDC says this acquisition, if approved, would improve its capacity in the health care market, where it has introduced an on-line eligibility system for health care services.

During the year, NDC introduced the Network for Electronic Transaction Services (NETS) for financial services, which offers banks an integrated package of traditional services and provides them with the opportunity to expand their fee revenue base in corporate, business, and consumer markets.

NDC, appointed by IBM as a value-added distributor for that company's equipment, will introduce treasury bank and pharmacy management systems for the IBM PC.

During the past year, the company made changes in its Rapidata Division by redirecting marketing efforts to concentrate on vertical markets. It also restructured its network services group.

In international markets, Europe continues to be a profit center for the company, and with recent commitments by customers in Japan to install its systems, the company is making inroads in establishing itself in the Far East.

89

RECOGNITION EQUIPMENT

2701 East Grauwyler Rd.
Irving, TX 75061
(214) 579-6000

Last year this supplier of high-speed document and currency processing, data entry and information management systems (using optical and magnetic ink character recognition) cut its R&D budget by $1.1 million and increased its marketing spending by $900,000. If salesmen are having more fun than engineers at REI these days, at least the red ink that swept the company in 1982 turned a reassuring black in '83.

Revenues were up only about 4% to $117 million, from 1982's $112.4 million. The real news on the financial sheets was a profit of $9.6 million, a major change from the $14.2 million loss that 1982 produced.

Reason for the big change? In March of '82, a hot new management team was grafted onto REI's already winning technology base, and last year the hybrid began to bear fruit. Costs were cut throughout the organization. New president William Moore was quick to shed assets and products that didn't fit his tightly focused view of the company's business. Quality control improvements meant each sale cost less to fulfill.

Marketing people were added: the sales and marketing staff is, at 250 people, six times as big as it was when Moore arrived. The service organization was recognized as the sales tool that years of massaging REI's near-custom solutions to customer problems have made it.

One star of the edited product line in '83 was the Tartan Terminal system. The initial piece of an IRS order for the system added $2.2 million to REI's '83 numbers, and, if all contract options are exercised—never a sure thing—it could be worth $14 million. REI also continued to work on its anticounterfeiting labels for consumer goods, signing a $2.8 million contract to develop a new generation of its successful Signa system.

90

MICOM SYSTEMS INC.

20151 Nordhoff St.
Chatsworth, CA 91311
(213) 998-8844

Micom continued on its steady, steep growth path in 1983. The company racked up $113.7 million in revenues, a 46% jump over 1982. Net income was also up significantly, a gain of 48% to $18.3 million from $12.4 million. Employment jumped 70% to 1,560 from 915, and R&D expenditures nearly doubled, to $10.3 million from $5.5 million. In the five years since 1978, revenues have shot up 5,400% and net income has rocketed 14,800%. Not a bad way to celebrate the company's 10th birthday.

All phases of Micom's businesses scored well in 1983. The remote communications products sector, which includes items such as concentrators, protocol converters, modems, and multiplexors, recorded $53.8 million in revenue, just under half the corporate total. Local area network products, including data PBXs, the Insta series of line drivers and local datasets, and local-cabling, racked up $33 million through the year.

The LAN segment grew substantially during the year relative to the rest of the company, accounting for 26% of corporate revenues in the first quarter and 31% in the fourth quarter. Part of the growth was due to Micom's acquisition early in the second quarter of Kertec, a Cambridge, Mass., local network cabling concern. The company operates as a subsidiary of Micom and brought in some $1.6 million during 1983, DATAMATION estimates. Micom sources say the new subsidiary will be renamed Insta-cable but will continue to operate independently.

The success in the LAN segment of Micom's business represents the realization of the company's strategy of penetrating the low end of the local area network market as that niche expands. Yet the success does not come at the expense of either the remote data communications products that were responsible for Micom's initial success in the past decade or the Black Box Catalog, a subsidiary mail order retailer of data communications equipment. The Black Box Catalog, which was acquired in 1982, had revenues of $20.4 million in 1983.

Micom introduced several new products in 1983. Prominent among them is the Micro7400, a protocol converter that provides an IBM gateway for a dozen async terminals or PCs; it fully supports BSC and SNA and lets terminals switch among a pair of IBM hosts or minis.

Micom also introduced its Micro860 concentrator switch, which can connect up to eight Micro800/2 data concentrators. Other products introduced during the year include an X.25 packet assembler/disassembler and a 9.6Kbps pocket dataset.

91

COMPAQ COMPUTER CORP.

12330 Perry Rd.
Houston, TX 77070
(713) 370-7040

Without a doubt, Compaq represents the Cinderella success story of 1983. The company announced its first product, the Compaq Portable Computer, in late 1982, with shipments slated to begin in January 1983. The product caught the imagination of dp users throughout the country, since it was the first portable computer to offer complete compatibility with the IBM Personal Computer. As a result, in its first year as a revenue-generating company, Compaq pulled in $111.2 million in revenues, resulting in $4.7 million in net income. The payroll grew equally, from 96 employees in December 1982 to 614 at the end of 1983. Not bad for beginners.

But Compaq's story, unlike Cinderella's, may not turn out as euphoric as it began. Early in 1983, IBM introduced the XT version of its PC, which included a hard disk drive. Compaq was not able to add a hard disk to its line until the late fall, when the Compaq Plus debuted. But in February 1984, IBM struck back with its own portable computer, aimed directly at Compaq. It, however, cannot accommodate a hard disk drive.

Virtually all of Compaq's revenues came from sales of the portable computer (the Plus line was not shipped in 1983). DATAMATION estimates that the company did generate some $10 million in sales of spare parts and in maintenance services.

Compaq's success in an area where many startups have been tried and few have succeeded stems primarily from its nearly absolute plug compatibility with the IBM PC as much as from its portability. Other vendors, such as Corona Data Systems and Columbia Data Products, introduced their products later and were not able to provide the same level of compatibility as Compaq did. Nonetheless, these and other companies—including IBM—have targeted Compaq in their quest for growth in the portable market, and Compaq will find it difficult to maintain the same growth in 1984 as it experienced in 1983.

92

CANADA SYSTEMS GROUP

2599 Speakman Dr.
Mississauga, Ont. L5K 1B1
(416) 822-5200

Canada Systems Group is Canada's largest computer services company, with a dozen offices in North America. Its 1983 revenues were $109.5 million (U.S. dollars), a 10% increase over the $99.8 million recorded in 1982. Net income in 1983 was $800,000, erasing a $5.4 million loss in 1982.

Late in the year, the company was reorganized into groups. The Processing and Professional Services group is responsible for the production aspects of processing centers, network services, I/O services, and professional services. The Financial Services group includes the Banking and Insurance division and the Commercial Marketing division, while the Industry Services group includes other industries.

The company introduced several new services during the year. The Corporate Income Tax software for IBM PCs allows tax preparers to process and print tax returns inhouse. The Datapharm Rx pharmacy micro system is a turnkey product based on the IBM PC that performs prescription filling, patient profile recording, and third-party billing functions as well as basic accounting for pharmacists. For large systems, CSG introduced the ISF Infocenter support facility to aid end-user computing by providing menu-based inquiry and report writing, graphics, and other business functions.

CSG introduced several on-line databases during the year, including STEPS (simplified text extraction procedures) for on-line access to some 550,000 businesses in Canada through Dun & Bradstreet's Dun's Market Identifier file, and the Canadian Federal Corporations and Directors database, which includes financial and personnel data from 135,000 Canadian companies.

93

COMMERCE CLEARING HOUSE INC.

4025 West Peterson Ave.
Chicago, IL 60646
(315) 583-8500

Commerce Clearing House didn't have a good year in 1983. Revenues were up only 8.1% to $378.8 million from the $350.1 million reached in 1982. Net income was affected by CCH's decision to restructure its dp business group, which was reaching for sales in the turnkey business. This restructuring caused a $15 million write-off, which brought net earnings down 21% to $24.9 million. CCH had started this business to capitalize on its easy entree into the accounting and law professions, which have long been users of CCH's accounting and legal professional publications.

CCH's dp operations generated revenues of $109.2 million in calendar 1983, barely up from the $104.5 million registered in 1982. The bulk of these sales come from tax return processing. The Multi-Tax division offers on-line tax compliance processing and planning services to professional tax return preparers like accountants and lawyers. Most of these revenues are produced during the first quarter of the year, when the tax rush is on. CCH has yet to find a way of expanding its dp business, and time is running out as competiton in the industry becomes more and more intense.

94

CULLINET SOFTWARE

400 Blue Hill Dr.
Westwood, MA 02090
(617) 329-7700

Last year Cullinane Database Systems changed its name to Cullinet Software. What it didn't change was its winning way: revenues vaulted over the century mark to $108 million, almost 70% over 1982's already healthy numbers. Net income rose to $15.3 million, up almost 48% from $8 million the year before.

Aside from its new name, Cullinet's three big announcements last year were IDMS/R, the Information Database, and the Cullinet Personal Computer System. IDMS/R takes what has been Cullinet's flagship database management system, IDMS, and adds the relational capability that dp fashion now decrees. IDMS/R can operate as either a network or a relational database system. The Information Database communicates data from IDMS databases to microcomputer users. The Personal Computer System is a management and decision support package for the IBM PC.

These systems are scheduled for volume shipment this year, but gossip has suggested that problems exist at beta sites for IDMS/R. Cullinet has vigorously denied these reports, and Wall Street analysts have apparently discounted the rumors. For example, Paine Webber has forecast continued 50% revenue growth rates for the next few years.

Still, IDMS/R is not really a new product; it is the enhancement of a veteran winner, IDMS, first introduced by Cullinane in 1973, but based on an even earlier system acquired from B.F. Goodrich. Even so, it is generally agreed that IDMS is better than IBM's DL/1 and IMS database systems, and that Cullinet's associated products also have the edge.

Among Cullinet's acquisitions during '83 was Computer Pictures Corp., specialists in management graphics. The convertibility of this software to microcomputers seems to have been a major factor in Cullinet's decision to buy the company.

95

SCHLUMBERGER LTD.

277 Park Ave
New York, NY 10172
(212) 350-9400

Oil industry services giant Schlumberger spent some $300 million over the past three years buying up several companies in the CAD/CAM business, and last year didn't have much to show for it. DATAMATION estimates dp revenues increased a mere 7% to $108 million in 1983. While $5.8 billion Schlumberger does not disclose the earnings on the $2 billion worth of individual operations unrelated to oilfields, observers say the return on investment to date does not look like a gusher.

Schlumberger subsidiaries Applicon, Benson, and Manufacturing Data Systems Inc. have been consolidated into a Computer Aided Systems group along with a number of test equipment manufacturers. The company reports that economic activity spurted in the second half, with orders up 36%, yet the enormous success of newer CAD/CAM players like Daisy Systems and Prime Computers is having an effect on Applicon in the $2.1 billion market.

To stay on top, Applicon introduced the Bravo! system, based on the 32-bit superminicomputer from DEC. It is an integrated system of application and systems software. All the software bells and whistles, like menu-driven instructions, prompts, and help commands throughout, are included.

Schlumberger spent $339 million last year on R&D and not all of it went to new oilwell thermometers. The company brags about its work on artificial intelligence, and given the resources Applicon has behind it, the little companies in the CAD/CAM market may have to contend with a real breakthrough product someday.

96

DOCUTEL/OLIVETTI CORP.

106 Decker Court, Las Colinas
Irving, TX 75062
(214) 258-8610

Two years ago the outlook for Docutel was bright. It had merged with the U.S. operations of a European office products powerhouse, Olivetti, and had the cash to expand its automated teller machine (ATM) business and simultaneously have access to the hot office products market with Olivetti personal computers, typewriters, and other state-of-the-art products. Business magazines hailed the merger.

So much for their optimism. In 1983 the new Docutel/Olivetti oozed red ink out of every corporate pore. Combined revenues of the Docutel ATMs, its knitwear business, and the Olivetti office equipment line were $221.8 million, up significantly from the $147 million of 1982. Profits were nonexistent—the company posted an $18.3 million loss, with most of it occurring in the fourth quarter and related to its dp operations. DATAMATION estimates revenues were up 6% to $150 million.

Docutel's first line of personal computers was discontinued and replaced with a line of IBM PC-compatible units in desktop and portable models. Faced with a horde of Japanese electronic typewriters that could more easily be connected to pcs as printers, the Olivetti Praxis line had to be discounted to attract buyers, and $10 million in inventory was written off.

Now the horizon is also not clear. Docutel's basic business, its new ATMs, faces an uncertain future as market saturation approaches—most banks already have cash machines. Docutel may not be be able to make inroads into new locations, such as supermarkets, when faced with renewed competition from archrival Diebold and new products from IBM and NCR.

97

DECISION DATA COMPUTER CORP.

100 Witmer Rd.
Horsham, PA 19044-2282
(215) 674-3300

Peripherals for IBM equipment are central to the success of Decision Data. Last year it shipped about 85% more of its printers and 50% more of its crt workstations than in the year before. The increased size of the company's installed base meant service revenues also rose dramatically. The company also managed to reduce general and administrative expenses to 9% of revenues, from 12% in 1981. Revenues leapt by 40% to $103.8 million, from 1982's $74.3 million. Despite an unfavorable tax situation, profits kept pace, rising 41% to hit $5.4 million from 1982's $3.8 million.

Riding the good news, the company went to the financial markets in March and sold 2.3 million shares of common stock, raising about $19 million. Management used the new cash to reduce long-term debt to about $600,000, and to purchase warrants for several million shares held by Data Recording Instruments Ltd. (DRI still owns about 4% of Decision Data's stock, down from about 14%.)

The company forecasts revenues and earnings that "will continue to surpass the 20% annual growth rate" of the industry. To help make its predictions into truths, management signed an offshore manufacturing deal with Tatung Electronics of Taiwan, where it will move the fabrication of some subsystems for its crt workstations.

Also part of Decision Data's growth strategy is a new subsidiary, International Computerized Telemarketing Inc., a software-driven telephone marketing system. The company hopes the new enterprise will reduce Decision Data's total dependence on IBM plug-compatibility for its business.

Other new products shipped in '83 were a 12-inch crt workstation, a letter-quality printer, and a cluster controller.

"Forget Miniaturization. I want a *BIG* computer."

CARTOON BY SIDNEY HARRIS

98

PRINTRONIX INC.

17500 Cartwright Road
Irvine, CA 92714
(714) 549-7700

The general malaise in the minicomputer market definitely had an impact on impact printer maker Printronix. During 1983, sales of its best-selling model, the P300, were flat, reflecting the overall trend in the minicomputer market.

At the high end of that market, however, there was good news. The faster supermini printers inherited from Data Printer Corp. made a valuable contribution to sales growth in 1983. In fact, the company's dp revenue jumped 31% to $101.3 million, beating the 1982 growth gain of 28%. Earnings were also up 24% to $6.8 million, double the increase for 1982.

The 10-year-old printer manufacturer clearly made a smart move in buying Data Printer, the Malden, Mass., maker of high-speed band and chain-train printers. Printronix wasted no time in showing off its expanded product line. In May, the same month as the takeover, Printronix turned up at the NCC touting the Model 2000, a 2,000 lpm printer developed by Data Printer.

The Data Printer acquisition filled in a gap in Printronix's product line. Until then, the company had offered its oem customers 150 to 600 lpm printers targeted mainly at the mini. Data Printer's 600 lpm to 2,000 lpm models shifted Printronix into the supermini and mainframe markets.

Static sales in the mini realm made this move all the more necessary. Printronix had already anticipated this in 1982, when it launched its MVP printer for the small business system and office automation markets. Sales of the MVP last year were lower than expected, however. Retrenching, Printronix moved the MVP into the microcomputer arena last year, tailoring it for micro applications. Also last year, the company came out with the Intelligent Graphics Processor for the MVP printer. Other new products included the "extra quiet" P6000XQ printer and the 4000 series matrix line printer for graphics applications such as CAD/CAM.

99

FLOATING POINT SYSTEMS

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(503) 641-3151

Floating Point Systems continued to grow modestly in 1983, with revenues increasing 12.6% to $100.2 million. Net income rose at a slightly steeper rate, a 14% increase to $13.1 million. The company makes a wide range of floating point and array processors, and brought out several new models during the year.

Primary among the new product introductions was the FPS 5000 series. Aimed directly at the signal and image processing markets that have dominated the company's user base since 1975, the series consists of six basic product groups that range in performance from 8 to 62 million floating point operations per second. The top-of-the-line 62 MFLOP model costs less than $100,000. The series uses multiple arithmetic VLSI coprocessor chips directed by a single cpu, permitting modular configurations.

Within the signal and image processing markets, Floating Point's customer base has changed significantly over the past year. Revenues from seismic imaging technology dropped 55%, while sales of medical imaging technology grew 41%. That gain may be short-lived, since General Electric, a big medical systems customer, recently announced it was dropping Floating Point as its primary supplier.

For the simulation market, sales of the FPS-164 scientific computer doubled in volume for the second year in a row. In 1983, that unit accounted for $19.2 million in sales, compared to $9.5 million in 1982. Sales into the simulation market grew 64% during the year, when other products were taken into account. The FPS-164 was enhanced during the year with expanded memory capacity and a new FORTRAN compiler. Customer acceptance of the enhancements raised the average selling price per unit from $300,000 to $375,000.

100

MEAD CORP.

9333 Springboro Pike
Miamisburg, OH 45401
(513) 865-6800

When Mead Corp. is mentioned, paper products usually come to mind, but Mead Data Central (MDC) is beginning to change this. Mead Corp. ventured into the electronic publishing business in 1970 by investing in a computerized information services division. Off to a slow start, MDC has overcome years of setbacks to become one of the DATAMATION 100, as total revenues increased to $94.5 million from $66.2 million in 1982.

Internal conflicts, including managerial turnover, inadequate financial backing, and questions of confidence in MDC's new product created a disturbing background to the introduction of on-line data services a decade ago. Also, Mead's computerized legal research service, LEXIS, received disheartening reviews at its debut in 1973. LEXIS has arrived before its time—lawyers were unwilling to be pioneers in the computer field. Later, when LEXIS appeared in law schools, students there found it a valuable service; once established in law firms, these former students brought with them a regard for LEXIS, and revenues began to increase. But the story doesn't end here.

Mead Data and its parent company continued to battle over finances. Allocation of corporate development funds to its divisions was a concern. Then, in 1977, when LEXIS began to show a profit, this money was not funneled back to MDC but was invested in unsuccessful Mead Corp. projects.

Finally, in 1980, there was a new addition to the MDC family—NEXIS. A general information on-line database service, NEXIS had a more promising forecast than did LEXIS at its inception. Though expensive to use—$50 a month plus $20 an hour for connect time, a telecommunications charge ranging from $8 to $12 an hour, and search charges of up to $18 during peak hours—NEXIS is still expected to show a profit this year.

Because of its abundance of information, MDC is surpassing the competition both in revenues and size (it has the largest on-line full-text database). Though net income and R&D expenditures were not disclosed by Mead, the future seems promising for this computer-assisted research company. An electronic clipping service (ECLIPSE) is now available for LEXIS and NEXIS users who need to be informed of current trends or get timely information on a specific subject. In an effort to broaden its market, MDC's database will be offered on IBM hardware.

A paper company's shaky venture into the legal information service field has produced one of the largest electronic information retrieval services available today. ◆

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CIRCLE 81 ON READER CARD

Japan is more friend than foe in the struggle to survive U.S. dp domination.

EUROPE WARMS TO THE RISING SUN

by Fred Lamond

The European computer industry sees Japan less as a threat and more as a welcome ally in the struggle to survive U.S.—and especially IBM—domination of free-world computer markets. Are the Europeans in fact, deluding themselves and, like Little Red Riding Hood, opening their doors to a wolf that will soon gobble them up? Or, on the contrary, have they shrewdly assessed the situation? Japan's status as friend or foe can best be determined by examining its European product portfolio.

The Japanese computer products currently offered on the European market fall into three main groups—components and peripherals, private label systems, and personal computers. The components, notably semiconductor (RAM) memories and peripherals, are sold on an oem basis to European computer manufacturers and system integrators that incorporate them into their products. The second category of equipment consists of large IBM 370-compatible mainframe processors and systems that are manufactured in Japan but sold in Europe under the labels of U.S. or European-based suppliers. Also sold on European soil are Japanese-built personal computers distributed under their manufacturers' own labels through the usual independent retail outlets.

European manufacturers view the components and private label systems products as survival aids against increasingly fierce U.S. competition. The pcs are not yet seen as any sort of threat in Europe, or in the U.S. for that matter.

Semiconductors are another story. The Japanese VLSI circuit project enabled Japanese semiconductor component manufacturers to overtake U.S. suppliers in certain key areas, notably semiconductor memories. They currently supply the major share of the free world's consumption of 64K RAMs and will be the first to offer 256K RAMs. In fact, Fujitsu already incorporates the 256K RAM in its M16 personal computer.

While these Japanese advances have caused consternation among U.S. semiconductor makers, they haven't made any waves in Europe, which has no independent (European-owned) semiconductor industry worth talking about. Set up in 1978 with government capital, British-owned Inmos produces 64K dynamic RAMs to help the cash flow, but its main hopes rest on its Transputer microprocessor (TM).

European dp manufacturers thus see the Japanese semiconductor industry primarily as a welcome alternative source of components—a source they will use more and more now that the U.S. has slapped reexport restrictions on products incorporating U.S. designed or built components.

Nor can American semiconductor manufacturers claim for much longer that they are the only ones serving European employment needs, for the Japanese are also opening European manufacturing and assembly plants. Fujitsu, for example, manufactures most of the components and subassemblies it supplies to ICL at the Manchester semiconductor plant it bought from the British mainframer as part of its collaborative deal.

PACT HELPS ICL SURVIVE

This pact, signed in the fall of 1981, is widely credited with having ensured ICL's survival as a profitable British-owned computer manufacturer—at least in the mainframe realm. Under the agreement, ICL gets two to three years' advance notice of new circuit generations developed by Fujitsu. This allows the company to get a head start on processor designs based on the new circuits.

As early as 1982 ICL thus was able to start planning a new generation of 2900 series mainframes based on Fujitsu 10,000-gate logical circuit chips. These chips, which will not become generally available until next year, are 14 times more integrated than the 700-gate chips that IBM uses in its current generation of 4300 and 308X series processors. The U.K. company was also able to expedite the design process by using CAD/CAM programs developed by Fujitsu. In addition, it subcontracted with Fujitsu for those subassemblies that the Japanese firm could build more economically.

Collaboration with Fijitsu will therefore enable ICL to announce the 2 MIPS DM1 this year—six to 12 months before IBM unveils its next generation of 4300 processors. ICL's 7 MIPS Estriel introduction will come shortly after IBM's announcement of the Sierra series, which may use less highly integrated logical circuitry. Without Fujitsu's ICs, it is doubtful whether ICL would have been able to design another generation of 2900 series mainframes capable of competing effectively with the IBM 4300 and 30XX series.

A similar collaborative deal has enabled the German chemical combine BASF to stay at the forefront of magnetic support technology. Ever since it invented the audio tape recorder 50 years ago, BASF has been a natural supplier of high-quality magnetic tape reels and recording disks for the computer industry. Nevertheless, it has no indigenous expertise for manufacturing the drives, which users increasingly order from the same source as the recording media, especially since most drives are furnished as fixed disks.

In the early 1970s, BASF either built its own 3330 and 3350-type disk drives under license from Century Data Systems or imported them directly from the U.S. These drives later suffered from reliability problems. To overcome such problems in the Winchester era, BASF collaborated with Nippon Peripherals Ltd., the disk and tape manufacturing subsidiary jointly owned by Fujitsu and Hitachi.

The Japanese side builds the drives, while the German end supplies the data modules. The final product has satisfied everyone, especially BASF, which has continued to expand its revenues in an increasingly competitive market.

In the oem market for desktop personal computer peripherals, the fight is between pure U.S. and pure Japanese diskette drives, with Sony ranking as the leading Japanese supplier. European vendors regard the Japanese products as more reliable, both in supply and performance. Indeed, the unnerving de-

The Japanese are first-class precision engineers of other people's concepts.

livery delays on U.S. drives sometimes put the sales and survival of some of their smaller oem customers at risk. European pc makers have thus been among the first to embrace the new 3½-inch Sony mini-diskette drive, which appeared on the portable ACT Apricot and several other European makes well before Apple adopted it for its Macintosh and Lisa II series.

At the high end of the market, both Fujitsu and Hitachi supply complete Japanese-built, IBM-compatible processors that carry the labels of their European distributors. While U.S.-based National Advanced Systems was first off the mark in 1979 with large Hitachi-built mainframes (the AS 7000, AS 9000, and more recently the AS 8000 and AS 6600 systems), the same hardware has also been marketed under the BASF and Olivetti labels since 1981. Siemens has sold large Fujitsu processors and complete systems under its label since 1979, while ICL has done the same thing, though not as successfully, since 1982.

There is no European labor content whatsoever in these large Japanese mainframes, which are essentially a cash cow for European distributors. By peddling these products through their existing sales and support networks, European distributors earn a 40% distributor's share of the end-user price.

By rounding out their product lines, the large Japanese mainframes also make it easier for their European distributors to sell their other products to users who prefer to limit their suppliers. On that supplier list are BASF for plug-compatible disks, magnetic tape drives, and printers; ICL and Siemens for small- to medium-size non-IBM-compatible mainframes, communications networks, and intelligent processors; and Olivetti for financial terminals, personal computers, and word processors.

Like the BUNCH companies (Burroughs, Univac, NCR, Control Data, and Honeywell) in the U.S., European mainframers ICL and Siemens find they can sell only their idiosyncratic 2900 and 7.500 series mainframes to their existing customer base, which shrinks a little more each year. This shrinkage is caused by customer defection to the IBM-compatible world, which provides a much larger choice of system and applications software products. By offering IBM-compatible mainframes, ICL and Siemens can both retain the trade of such users and can even counterattack by collecting orders from some traditional IBM users. The Japanese connection thus enables them inexpensively to capitalize on the IBM-compatible trend.

Desktop personal computers are the only Japanese end-user products that appear on the European market under their own labels. NEC, Fujitsu, Hitachi, Mitsubishi, and

FIG. 1

JAPANESE EXPORTS TO WESTERN EUROPE—COMPLETE COMPUTER SYSTEMS[1]

	(VALUE IN $M[2])		(VOLUME IN UNITS[2])	
	1983	1982	1983	1982
Benelux	28.9	10.1	17,800	3,002
France	12.3	8.5	45,988	3,600
Italy	8.9	9.7	15,120	735
Scandinavia	4.5	1.6	8,791	1,858
Spain	1.2	2.6	5,204	718
U.K.	15.5	11.3	31,130	9,630
West Germany	57.3	24.4	45,732	17,211
Others	5.2	3.8	8,450	2,927
TOTAL	**133.8**	**72**	**198,215**	**39,681**

[1] Includes cpus with I/O units

[2] All figures are for the 11 months through November.

Source: John Aczel

FIG. 2

JAPANESE EXPORTS TO WESTERN EUROPE—CPUS

	(VALUE IN $M)		(VOLUME IN UNITS)	
	1983	1982	1983	1982
Benelux	0.7	0.4	784	210
France	1.2	1.0	1,875	471
Italy	0.2	0.1	674	65
Scandinavia	2.1	0.4	5,053	202
Spain	1.8	0.6	776	45
U.K.	7.2	0.4	36,375	93
West Germany	17.7	9.8	26,900	10,380
Others	1.3	0.2	1,627	191
TOTAL	**32.2**	**12.9**	**74,064**	**11,657**

All figures are for the 11 months through November.

Source: John Aczel

FIG. 3

JAPANESE EXPORTS TO WESTERN EUROPE—STORAGE UNITS

	(VALUE IN $M)		(VOLUME IN UNITS)	
	1983	1982	1983	1982
Benelux	27.3	20.3	21,052	6,431
France	8.1	4.8	33,641	7,617
Italy	4.0	0.9	23,129	5,822
Scandinavia	8.4	3.0	20,846	7,283
Spain	4.4	5.8	2,930	2,360
U.K.	40.2	10.3	368,549	24,351
West Germany	54.5	24.8	391,415	17,234
Others	10.6	4.8	140,751	44,761
TOTAL	**157.5**	**74.7**	**1,002,313**	**115,859**

All figures are for the 11 months through November.

Source: John Aczel

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CIRCLE 104 ON READER CARD

Japanese propaganda for the fifth generation has stimulated interest in AI and expert systems.

Toshiba sell professional personal computers, while Epson, Sanyo, and Sharp market home computers in Europe.

Like Japanese cameras, tv sets, and stereos, Japanese pcs are well engineered, ergonomic, good-looking, and thoroughly reliable. So why then do European personal computer manufacturers view these rival wares with such smug complacency?

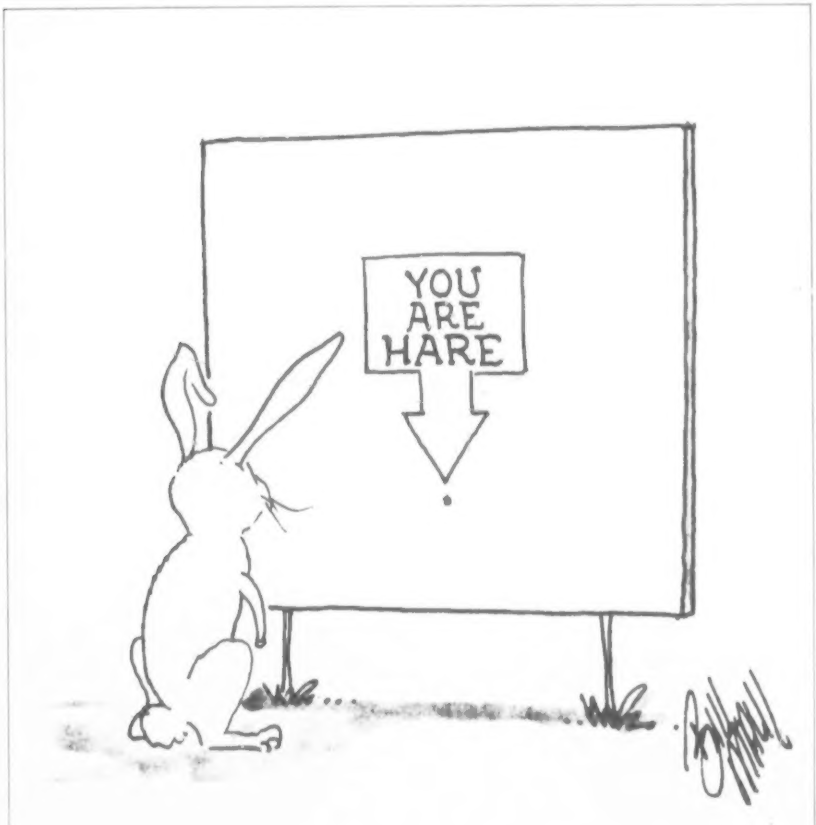
Maybe it's because the fast-moving personal computer market shows up Japan's main limitation in high tech. While the Japanese are first-class precision engineers of other people's concepts, they themselves are not conceptually creative. None of the Japanese pcs break new ground or take the state of personal computing one step further. With the pc, as with other equipment, the Japanese have simply produced a better-engineered, more reliable product to existing de facto industry standards.

These standards, however, are continually changing, and the Japanese are finding it hard to keep up. In 1981, they had just brought out their first CP/M-based, 8-bit personal computer models when the European professional pc market was already moving to 16-bit computers in the wake of IBM's PC announcement.

Late 1983 saw the appearance of such 16-bit machines as the NEC 8800 and the Fujitsu M16. All are single-station systems supporting MS/DOS and CP/M-86. In order to offer a compatible growth path from their 8-bit models, the Japanese manufacturers have been getting licenses for Microsoft's MSX, the 8-bit version of the MS/DOS operating system.

But even as the Japanese manufacturers gear up for high production of these systems, the European and U.S. personal computer market has already become more interested in multi-user systems running under Concurrent CP/M-86, Xenix, UniPlus, or Pick. Also becoming popular are local area networks linking Xenix-shared file servers with MS/DOS or CP/M application processors.

If the professional desktop computer market is evolving too fast for the Japanese, then the home computer market ought to be their oyster, since competitive pressure forces prices down to levels where only low-cost, high-volume producers can be profitable. Yet even here, Japanese manufacturers like Sanyo and Sharp have found themselves underpriced and outsold by Sinclair, the Freddie Laker of the home computer market.



CARTOON BY WILLIAM MAUL

JAPANESE HAVE JUST FOUND AI

After some initial alarm, the Japanese hullabaloo surrounding the fifth generation is now recognized as an avowal of Japanese weakness in the domain of creative conceptual design. Far from being ahead in expert systems and other artificial intelligence (AI) applications, the Japanese have only just discovered this field in which American, British, and French computer scientists have been laboring for 15 years.

Shorn of stylistic embellishments, the Japanese message at the fifth generation conference they called two years ago can be summarized as, "Let us all—Americans, Europeans, and Japanese—pool our ideas of fifth generation applications at the original research stage" (at which Japanese are notoriously weak). "When the feasible systems have thus been identified, it's every firm for itself in the engineering, production, and marketing of end-user products" (at which Japanese are very good).

Europeans, like Americans, have seen through this ploy, and at government levels, at least, it's no deal. There will be some cooperation on an intercompany basis, as part of the ICL-Fujitsu and Siemens-Fujitsu collaborations, for instance, but little more than that. Instead, European mainframers ICL, Siemens, and Honeywell-Bull have decided to collaborate on AI. (The trio has a new joint research center near Munich.)

What Japanese propaganda for the fifth generation has done, however, is open European government coffers to the academic pioneers of expert systems—researchers who had virtually no funding only a little over two years ago. In fact, few people outside Imperial College in London, Edinburgh University, and the University of Aix-Marseilles had even heard of the Prolog AI programming language developed there, until the Japanese announced that they were adopting it as their standard. Now the Prolog progenitors are receiving the wholehearted backing of their governments to develop the language into a fully supported program product on leading pcs, mini, and mainframe models. It will also be groomed as the main rival to the American Lisp.

In stimulating interest in expert systems and artificial intelligence, the Japanese have probably brought forward the widespread applications of these technologies by several years. So it's easy to see why Europe has warmed to the land of the rising sun. ●

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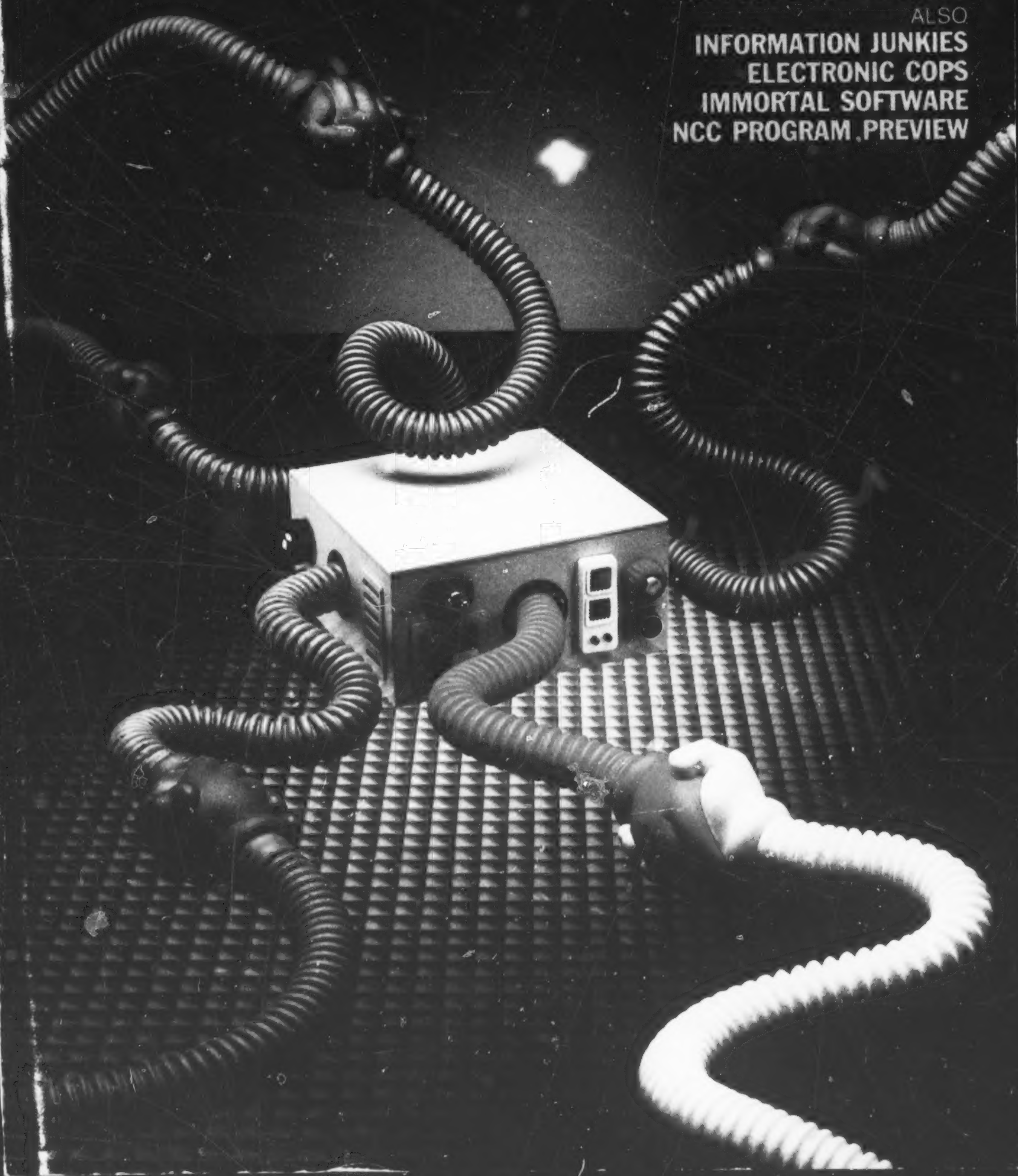

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COVER SCULPTURE BY KATHY JEFFERS/
PHOTOGRAPH BY WALTER WICK

The first signs of market maturity are on display in a new survey of vars and oems.

IS THE OEM MARKET MATURING?

Some of the early signs of market maturity are now being seen in the world of value added resellers, systems integrators, dealers, and original equipment manufacturers of turnkey computer systems. The rapid shift to microcomputer-based systems and intense price competition made things tough last year, if the just-released analysis of the market is any indication. Unit shipments were flat at 171,842 in 1983 compared with the prior year, according to the new survey of 2,007 companies by Sentry Data-base Publishing, Hudson, Mass. The 1984 edition of its *Directory of Systems Houses and Oems* says that the dollar value of 1983 sales to end users declined significantly, to $3.1 billion from the $3.6 billion recorded in 1982. The rapid shift to microcomputer-based systems and declining hardware prices explain the dollar drop in the face of flat shipment rates.

These low dollar figures and flat shipments are not an indication of a dying business; it's just that the industry is entering a new phase. Many end-user applications continued to enjoy strong popularity, judging by the sharply increased sales to certain markets. The number of systems shipped for general accounting applications grew 45% to 90,533, or about half of the total number shipped. But look at the relatively modest growth rates for word processing, 26%, and mailing lists, 19%.

Indeed, the respondents indicated that shipments of products for several applications actually declined: agricultural systems, CPA packages, stock and other securities accounting, and blood analysis packages are all examples of declining markets. Whether those declines are due to segment conditions, to a more broad-based market saturation, or both remains to be seen.

Another indication of the slowing of the boom for the value-added remarketers is in the diminishing number of new companies entering the business. Existing turnkey operators will be pleased to hear that 62 new companies called themselves oems last year, the smallest number of new entrants since 1973. The 9% growth rate for new starts in the market, sustained over the past five years, appears over.

It's clear by the numbers that the common applications have become just that—common. Vars looking for a market niche have to search harder for some end-user need that is not being fulfilled, or else they run the risk of meeting too many other players. Certain applications look like ideal areas for new vendors. Graphics-based systems appear to be immensely popular: about a third of all systems now include at least one graphics software package. Expert systems, one of the key parts of the new artificial intelligence effort, are hot topics in medical circles (see "Just What the Doctor Ordered," January, p. 201-13); medical diagnosis system sales climbed more than 400% to 33,296. All the recent hype about computers in education has proved to be more than just hype—schools are buying them, as are big companies for purposes of training. More than 74,000 systems were sold to schools and companies last year by 334 oems, or three times the level of 1982 shipments (see "Learning the Education Market," p. 210-25).

The Sentry survey was done earlier this year. Questionnaires were received from 70% of the domestic vars, oems, systems houses, dealers, and software houses. In addition to identifying their primary lines of business, the oems were asked to list the brand names of hardware and peripherals they were buying.

As vendors and security analysts may already have noticed, the oem market became a quagmire of shifting allegiances last year.

FIG. 1

FASTEST GROWING END-USER MARKETS IN 1983

MARKET	% CHANGE
Motor vehicle dispatching/routing	+1,455
Library automation	+ 798
Credit verification	+ 532
Law enforcement	+ 481
Public utility billing	+ 450
Nursing home admin.	+ 395
Seismic data processing	+ 381
Teaching/instruction	+ 378
Motor vehicle fleet acctg.	+ 349
Medical diagnosis	+ 344

SHRINKING END-USER MARKETS IN 1983

MARKET	% CHANGE
Stock/securities acctg.	−86.7
Blood analysis, blood bank accounting	−73.3
CPA client write-ups, billing	− 6.8
Agricultural accounting	− 6.2

FIG. 2

TEN MOST POPULAR APPLICATIONS FOR VARS

APPLICATION	1983 UNIT SHIPMENTS	% CHANGE
Word processing	93,662	26
General accounting (receivable, payable, ledger, payroll)	90,533	45
Order Entry	88,391	53
Mail list/labels	87,339	19
Sales analysis/forecasting	85,776	59
Database management	85,662	68
Billing/invoicing	84,408	44
Inventory control	71,116	71
Electronic mail	70,074	150
Graphics	65,840	143

Two years ago ago, agsystem sales soared; last year they declined.

The switch to microcomputer-based systems accelerated. Last year oems shipped 67,732 micro-based systems and 20,424 minicomputer-based systems, up 84% and 50%, respectively, from the year before. The big changes in the marketplace were indicated not so much by the increases in shipments but by the nameplates on the systems. Lots of surprises here.

APPLE OUT OF OEM BUSINESS Apple Computer Inc., Cupertino, Calif., practically disappeared from the oem business in 1983 due to dealer conflicts and the IBM PC assault. In 1980, Apple had 48.7% of the micro market, but last year it posted a 4.9% share, an also-ran after years of dominance. The grand old names in the computer business wiped the Silicon Valley wonderboys off the oem map.

Digital Equipment Corp., Maynard, Mass., regained some of the luster it lost in the business, though few seemed to realize that the Rainbow, DECMate, and Professional lines of microcomputers had the number one rank when it came to micros bought by vars. Its 11.4% share among microcomputer suppliers to the oem market indicated that although DEC's pc sales were a disappointment to the company and to analysts, the legion of DEC oems and dealers remained loyal to the company that the Olson brothers built. It also shows the level of dependence on DEC software and hardware architecture. As many people have said, don't count DEC out of the computer business—there are hundreds of thousands of satisfied users running PDP-11s and VAXs.

The fact that IBM ranked only third in the microcomputer category with a 9.1% share may be a surprise to those who thought it would emerge as number one in the oem markets. Its astounding success in the personal computer business is really a success in only two areas, not throughout the marketplace. Sales to major corporate dp centers and through retail channels like Computerland were the big factors for IBM last year, since it couldn't spare as many machines for its var customers. Obviously a lot of vars wanted to sell the PC but couldn't get their hands on adequate numbers of machines. Hence the success of IBM PC clones from Texas Instruments, Eagle, and Columbia Data Products. The 9.1% market share will almost assuredly rise this year as Big Blue ships more units.

To find Commodore as the number two ranking micro cpu-maker beating out even mighty IBM will give Jack Tramiel, former Commodore president, some small consolation. Given its low-tech image and consumer marketing, how did the West Chester, Pa.-based consumer products company post such a strong showing in industrial markets? Obviously a number of oems thought the model 64 and the other Commodore products were a bargain capable of doing the job. Wonder how many of the Commodore oems told their customers what was inside the turnkey system?

As for TeleVideo's strong showing, with 8.5% of the micro market, congratulations must be given to Phil Hwang for the remarkable strategic shifts his company has made over the past two years. To have grown from an upstart terminal vendor who slew the traditional leaders to a top-ranked contender in the microcomputer market within a few years is more than many far larger and older

FIG. 3

PERCENT SHARE OF MINICOMPUTERS SOLD VIA SYSTEMS HOUSES/OEMS

MANUFACTURER	1979	1980	1981	1982	1983
Cado Systems	—	—	—	—	1.5
Century Computer	—	—	—	—	3.4
Data General	20.2	21.6	21.5	11.5	6.1
Datapoint	1.4	2.0	4.2	4.1	3.0
Digital Equipment	46.2	43.5	48.4	42.8	28.4
Hewlett-Packard	3.7	5.2	6.0	7.2	3.9
Honeywell	1.9	1.8	2.5	1.4	1.0
IBM	2.4	5.4	3.2	4.7	14.5
NEC Information Systems	—	—	—	—	1.7
Point 4 Data	—	—	—	—	2.0
Prime	1.3	1.5	1.5	11.0	1.4
Texas Instruments	2.0	2.1	1.8	5.5	2.3
Wang Laboratories	—	—	—	—	3.9
All others	20.9	16.9	10.9	11.8	26.9
Total Sample (units shipped)	11,089	14,066	14,463	13,440	20,424

FIG. 4

PERCENT OF PERSONAL COMPUTERS SOLD VIA SYSTEMS HOUSES/OEMS

MANUFACTURER	1979	1980	1981	1982	1983
Alpha Micro	—	—	1.5	1.0	1.8
Altos Computer	—	—	—	4.9	4.6
Apple	19.0	48.7	37.9	20.3	4.9
Columbia Data Products	—	—	—	—	1.4
Commodore	13.0	5.9	6.5	5.4	10.3
Corona Data Systems	—	—	—	—	3.5
Cromemco	4.6	1.7	2.1	2.4	4.9
Digital Equipment	—	—	—	1.0	11.4
Eagle	—	—	—	—	1.9
Hewlett-Packard	—	—	—	—	1.0
IBM	2.2	1.5	3.7	11.3	9.1
Kaypro	—	—	—	—	2.2
Northstar	5.0	2.1	4.3	6.1	4.9
Radio Shack	—	—	1.9	1.2	1.0
Reliance Computer	—	—	—	—	2.2
TeleVideo	—	—	—	3.5	8.5
Texas Instruments	—	—	—	3.3	4.3
Xerox	—	—	1.2	3.4	2.0
All others	56.2	40.1	40.9	36.2	21.1
Total Sample (units shipped)	9,344	18,188	21,750	36,792	67,732

DEC and Commodore, not IBM or Apple, were the top-selling micros last year.

companies have accomplished. And many have tried.

Success in selling microcomputers to oems in some cases meant fewer dollars and units shipped from the minicomputer vendors. DEC lost market share in the minicomputer business, dropping to 28.4% of the 1983 total from 42.8% of the 1982 total. In terms of units shipped, the DEC mini department for oems showed a flat shipment curve at around 5,800 boxes. Data General suffered a similar fate, though the strong end-user demand for its 32-bit family of boxes may have diverted shipments to its direct sales force. The big winner in the minicomputer business was IBM.

Nowadays a var can buy everything from a 4300 to a PCjr from Big Blue, and with a nice discount if the order is big enough (see "Doing Business With IBM," April 15, p. 136-3). More than 1,000 vars and value added dealers and other new IBM acronyms gave Big Blue a hefty new marketing force, and the market share numbers in minis told the tale. In 1983 IBM's oem market share leaped to 14.5%, or half the minicomputer market share of the traditional value added market leader, DEC.

NEWCOMERS INVADE VAR RANKS

The wave of newcomers to the var world also became evident in the rankings of the minicomputer vendors. Wang and Prime are two mini makers anxious to expand their var business, though only one showed some success last year. Wang's 3.9% market share in the mini business last year was a strong showing for a first-time effort. As for Prime's fall from grace, from 11% to 1.4%, the many shifts in emphasis at Prime indicate that the var effort of the past may not continue in the future.

Another sign of maturity, or at least a new phase for the industry, is the growing importance of the "other" category. The smaller vendors of minicomputer hardware collectively sold 27% of the systems last year, up from 11.8% in 1982. As the big vendors and their micro marketers extend their efforts toward the high-volume, low-price end of the market, a void appears open for customized applications-oriented packages on minis. As for the fate of the microcomputer-based "other" vendors, there are indications that their future is strictly on the fringes of the industry—their share of the micro-based turnkey business is down to 21% from a high of 56% in 1979.

The effect of microcomputers also was seen in the type of peripherals moved by oems last year. The survey found 438,659 peripheral devices sold last year, with dot matrix printers and floppy disk drives the leading categories. The 32% increase in peri-

FIG. 5

PERIPHERALS SALES VIA OEMS

TYPE OF PERIPHERAL	QUANTITY SOLD VIA OEMs 1980	1981	1982	1983	% CHANGE
Printers					
Dot matrix	15,920	51,156	68,994	82,999	+ 20
Letter quality (daisywheel, thimble)	—	—	20,524	25,761	+ 26
Line printers (under 300 lpm)	3,116	8,710	6,494	7,860	+ 21
Line printers (300 lpm & up)	3,266	6,833	6,581	8,270	+ 26
Teleprinter terminals (with keyboard)	5,263	27,633	19,403	14,830	– 24
Group Total	**27,565**	**94,382**	**121,996**	**139,720**	**+ 15**
Disk drives					
Diskette (floppy) drives	24,187	41,236	44,553	60,040	+ 35
5¼-inch Winchester drives	—	—	14,250	10,958	– 23
8-inch Winchester drives	1,170	4,558	8,423	6,843	– 19
14-inch Winchester drives	—	—	3,690	4,671	+ 27
Fixed disk drives	336	682	3,675	4,466	+ 21
Removable disk drives	8,376	11,197	8,958	7,610	– 15
Group total	**34,069**	**57,673**	**83,549**	**94,588**	**+ 13**
Tape drives					
Cassette/cartridge drives	2,082	4,444	6,708	8,106	+ 21
Reel-to-reel drives	3,264	4,323	4,296	6,463	+ 50
Group total	**5,346**	**8,767**	**11,004**	**14,569**	**+ 32**
Crt terminals/monitors					
Alphanumeric	37,425	89,008	96,007	52,147	– 46
Graphic	1,591	5,578	8,006	12,816	+ 60
Group total	**39,016**	**94,586**	**104,013**	**64,963**	**– 38**
Other					
Memory expansion boards	2,833	13,034	14,643	7,558	– 48
Digital plotters	152	773	1,205	3,093	+157
Group total	**2,985**	**13,807**	**15,848**	**10,651**	**– 33**

FIG. 6

DOT MATRIX PRINTER MARKET SHARE

MANUFACTURER	1982 Oem % MARKET SHARE	1983 Oem % MARKET SHARE
Centronics	2.4	1.2
Dataproducts	1.2	1.5
Datasouth	2.4	3.8
Digital Equipment	17.5	6.0
Epson America	25.3	10.3
IBM	1.6	2.8
Mannesman Tally	1.1	1.3
NCR	1.0	—
Okidata	9.0	29.2
Printronix	—	1.2
Siemens	—	1.9
Star Micronics	—	6.1
Texas Instruments	17.6	7.5
All others	20.7	17.6
Total Units	**68,994**	**82,999**

Okidata squeezed Epson out of predominance in the dot matrix printer business.

FIG. 7

FLOPPY DISK DRIVE MARKET

MANUFACTURER	1982 Oem % MARKET SHARE	1983 Oem % MARKET SHARE
Apple Computer	6.6	2.2
Commodore	2.4	1.1
Digital Equipment	—	1.2
IBM	7.2	1.6
Mitsubishi	1.7	1.1
North Star Computers	—	1.9
Shugart	12.6	22.0
Syncom	—	16.7
Tandon Magnetics	24.3	6.0
All others	45.2	46.2
Total Units	**44,553**	**60,040**

FIG. 8

5¼-INCH WINCHESTER DRIVE MARKET

MANUFACTURER	1982 Oem % MARKET SHARE	1983 Oem % MARKET SHARE
CMI	—	1.4
Control Data	—	5.7
Corvus Systems	4.3	3.3
Datamac	—	1.2
Hewlett-Packard	—	1.2
IBM	—	1.0
International Memories	5.2	12.3
Seagate Technology	1.9	1.6
Shugart	1.7	3.9
Tallgrass Technologies	—	1.1
Tandon Magnetics	23.2	6.0
All others	63.7	61.3
Total Units	**14,250**	**10,958**

pherals shipped in 1983 compared with the year-earlier period shows that customers are ordering more complete systems in the first round, since the overall shipment total of 171,000 did not increase dramatically.

Swift and significant changes in the peripheral vendor of choice appeared last year. Epson's strength in the dot matrix printer business showed some weaknesses last year. Despite the imprimatur of IBM for its PC systems, Epson's market share plummeted 15 percentage points to 10.3%. At the same time, a Japanese rival appeared to gain from its countrymen as well as from others. Okidata won 20 market share points last year, and by year-end was the largest-selling brand of dot matrix printers to oems.

Several other big names in the computer business lost significant market share in the printer arena. DEC and TI collectively lost 21 market share points. Significant shifts in marketing tactics are part of the explanation, but it also appears that the lower-cost Japanese products are starting to make significant inroads in the sales of peripherals by the big cpu vendors.

When it comes to disk drives of all shapes and sizes, the oem world turned to Shugart for more and more of its needs. The Xerox subsidiary had the number one rank in floppy drives, at 22% of a rising market—the 60,040 units shipped in 1983 by all vendors was a 33% increase over the year-earlier period. As for hard disks, Shugart had a growing share of the 5¼-inch market, a strong presence in the 8-inch segment, and was holding its own in other disk drive categories. In the red-hot 5¼-inch hard-disk sector, International Memories reigned supreme, with a 12.3% share of the business.

The decline in 5¼-inch hard-disk systems to 10,958 from 14,250 is not a misprint. It simply reflects the fact that a number of hard disks are being added to the micro-based

YOU KNOW ROBERTS, IT WASN'T MY IDEA TO HIRE YOU. I'M NOT IN BUSINESS TO DO FAVORS. I'VE GOT BUILDINGS TO PUT UP.
OH I TOOK YOU ON, SURE BUT I NEVER BELIEVED YOU COULD MAKE IT. BACKBREAKING WORK ROTTEN WEATHER...
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system by the machine vendors, not the systems integrators. Floppies remained an add-on product for the var, while Winnies became a feature more often installed by the machine maker at the factory. Given the tremendous price difference between the $2,000 or $3,000 retail price for hard-disk systems bought over the counter vs. the reported $500 or less cost to IBM of a hard-disk subsystem from Seagate or Tandon, it's not surprising that savvy buyers would rather include the Winnie as part of the original equipment purchase. Think of the hard disk as an auto air conditioner—it's a lot easier and cheaper to buy an auto air conditioning unit when you buy the car, rather than later.

As more and more hard-disk systems are sold and end users realize the value of their stored data, a source of backup memory becomes critical. The backup tape business is starting to take off, with all the signs of a future key product sector. New companies, venture capital money, and big promotions are in the wind. Already, reel-to-reel tape drive systems sales are soaring, up 50% last year to 6,463 systems. DEC and Cipher Data Products are the biggest factors here, with streaming tape drives rapidly taking over market preference from the start/stop technology.

The dust is starting to settle over the battleground on which the fight for crt market dominance took place. Big guns like DEC, NCR's ADDS, Lear Siegler and a host of other companies have all raised the white flag, and TeleVideo is now top dog. Its 16.5% market share in the oem world puts it ahead of the more established players. The operating philosophy of building low-cost terminals out of modular component assembly is right out of the Henry Ford handbook for mass producing cars: interchangeable parts. The Korean immigrant Phil Hwang added the American virtues of long production runs and built a big business, but now another company with even longer production runs is making a big play for the crt terminal market. Zenith Data Systems, subsidiary of the television set producer, has 5% of the business plus some sizable contracts with IBM and others to put its private label on power supplies as well as crts. And Zenith makes more tvs—several million a year—than anybody makes computers, except maybe for Commodore. It will be an interesting when TeleVideo and Zenith face each other tube to tube.

The rise of high-volume operations like Zenith and TeleVideo also shows how the turnkey computer systems industry is consolidating behind fewer key players in the big hardware categories. Only a few will survive, and only if they are smarter and more flexible than those who once dominated.

With the slowed growth rate of new vars and systems integrators, 1983 could be considered a watershed year, when the old excuse of poor economic times could not explain the slowdown in growth rates of new corporate entries. The declining dollar value of total oem sales also shows that the vars, oems, systems integrators, and software houses had better sharpen their pencils and sell their solutions to customers more aggressively, because the first signs of market saturation—the reduced shipment rates for general office systems—may be on the horizon.

FIG. 9

TAPE DRIVE MARKET

CASSETTE/CARTRIDGE MANUFACTURER	1982 Oem % MARKET SHARE	1983 Oem % MARKET SHARE
Archive	6.5	17.4
Commodore	20.1	13.4
Control Data	—	1.2
DEI	—	2.4
Digital Equipment	4.2	12.1
Hewlett-Packard	2.6	4.0
Innovative Data	—	1.2
Kennedy	—	2.6
All others	66.6	45.7
Total Units	**6,708**	**8,106**

REEL-TO-REEL MANUFACTURER	1982 Oem % MARKET SHARE	1983 Oem % MARKET SHARE
Cipher Data Products	7.7	7.3
Control Data	4.8	1.2
Data General	4.8	4.5
Digital Equipment	8.4	8.5
Hewlett-Packard	11.2	6.0
IBM	—	2.0
Innovative Data	—	4.0
Kennedy	12.6	8.5
Pertec	3.5	2.8
Telex	—	5.4
All others	47.0	49.8
Total Units	**4,296**	**6,463**

FIG. 10

ALPHANUMERIC CRT TERMINAL MARKET

MANUFACTURER	1982 Oem % MARKET SHARE	1983 Oem % MARKET SHARE
Adds	—	4.9
Data General	2.0	1.6
Digital Equipment	16.5	13.7
Electrohome Ltd.	—	3.3
Hazeltine	1.3	3.5
IBM	1.3	1.2
Lear Siegler	1.7	5.1
MicroTerm	—	3.4
Raytheon Data Systems	2.2	1.4
Soroc Technology	2.7	1.5
TeleVideo	13.0	16.5
Texas Instruments	7.5	2.7
Visual Technology	1.8	2.1
Zenith Data Systems	2.2	5.1
Zentec	1.4	1.7
All others	46.4	32.3
Total Units	**96,007**	**152,147**

The 1984 Directory of Systems Houses and Computer Distributors lists 2,007 oems in alphabetical order, by location, and by primary cpu vendor. It is available from Sentry Database Publishing, 5 Kane Industrial Drive, Hudson, MA 01749.

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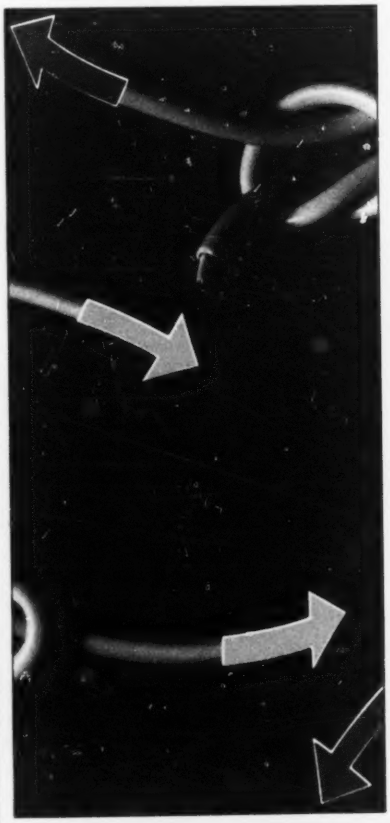

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COVER COLLAGE BY IVAN CHERMAYEFF

The personal computer is making change a constant in information centers.

THE EVOLUTION OF THE INFORMATION CENTER

by Tor Guimaraes

The evolution of the information center owes a lot to creationism. As is so often true in the dp world, IBM did the creating. Or, at least, the naming.

The concept that became known as the information center first arose in the '60s, but when IBM gave the idea a name in the '70s, information centers took off. And the explosive growth of personal computing in American corporations since then has made the information center a necessity.

Here's how the information center has evolved so far. I will also describe the shape I believe the information center must take in order to ensure that personal computing is a corporate computing asset.

The overwhelming growth of personal computing in organizations has created problems and situations that need to be managed, but the control mechanisms that are established must not stifle personal computing freedom within the organization.

Companies have learned that user participation in equipment acquisition, systems development and operation, education, and problem solving should be promoted. But MIS professionals must assume the responsibility of assisting users as they seek to satisfy their information needs.

MIS departments that don't accept this new challenge will find themselves increasingly isolated from company business activities and left to perform only the more mundane or specialized corporate information tasks. Personal, end-user computing grew out of the introduction of microcomputers in the late 1970s, and the concept has had little time to evolve in managerial terms. Yet, the experience of many companies reveals a strongly perceived need to manage user computing through information centers.

In the information center format, users depend on their MIS departments for resource acquisition, primarily because the software usually resides on the organization mainframe. But users may either access a generalized software package (usually purchased and installed by the MIS department) or user-developed applications software. The MIS departments provide training, education, and operational support. User access to application software is through a wide variety of terminals (crts, hardcopy, plotters) that may be centrally located or scattered throughout user departments. Access to these terminals may be controlled by the MIS department, the user department, or by individual users.

To meet these new challenges, the information center has evolved in several ways, handling its own problems and meeting its clients' needs with ad hoc solutions. I want to talk about this evolution and propose some changes in how most companies manage their information centers.

Phase I information centers: the past. Despite the existence of report-generating software packages such as Easytrieve and Mark IV, in this historic environment, end-user access to computer terminals was rarely possible. Few companies had any end users operating mainframe terminals. For the most part, the MIS department controlled all aspects of computing, from resource acquisition and systems development to report generation. The number, types, and capabilities of the software packages then commercially available was, of course, rather limited compared with what is available today.

Phase II information centers: the present. Motivated by the urgent need of MIS departments to reduce the backlog of user requests for information, in the late '70s IBM introduced the concept of an information center.

To reduce this backlog, IBM proposed that organizations make available to present and prospective computer users tools that would allow them to do their own computing. While the MIS departments would provide the necessary training, an integral part of the IBM information center concept was the notion that users *must* do their own computing. In addition to terminals, the suggested user computing tools included a wide assortment of software packages and procedural languages. Personal computers were not included in the IBM proposal for information centers.

Phase III information centers: the future. In direct contrast with the phase II notion that users must do their own computing, the cornerstone of phase III information centers is full user support. Full user support means that MIS departments assist users to satisfy their information needs by providing as many computing alternatives as possible, including developing systems for users whenever possible. The MIS department helps users select the appropriate solution to their specific problem, provides them with appropriate education and training, and assists them with problem management.

USERS SHOULD CHOOSE

Individual users should be able to choose any viable computing alternative as long as user department managers are willing to pay for it and overall company interests have been protected. It is important that MIS departments educate business managers about the company-wide and long-term implications of their departmental computing decisions.

Many user computing activities need to be managed in an integrated fashion under the aegis of the MIS department, among them, matching of user requests for information with appropriate computing alternatives, user training, user computing equipment acquisition, and problem management.

An opinion survey of MIS managers about problems encountered with personal computing reveals several items that may represent significant and unnecessary costs to an organization:

- Users of personal computers throughout the organization tend to "reinvent the wheel" by not sharing knowledge or access to tools, methods, vendors, etc.
- Because of their isolation, many users learn through an expensive process of trial and error.
- Since user experience about the managerial aspects of computing is cultivated through trial and error, exposure to major disasters is common. For example, file backup and recovery and system quality assurance measures are issues neglected by most users according to many MIS managers who are in

Personal computer users throughout the organization tend to reinvent the wheel.

touch with personal computing activities in their companies. But, worse, some MIS managers admit to a complete or substantial lack of knowledge about such activities.

- Many technical problems require a substantial investment of user time for solution. In many cases, it is in the organization's best interest that the problem be addressed by MIS professionals who have considerably more knowledge on the subject.

Many personal computing problems can be corrected by business managers if the problem is brought to their attention, so it is important that MIS and business managers periodically consult on the user computing activities within individual departments.

Several organizations with substantial personal computing activity have saved millions of dollars by implementing or promoting relatively simple measures such as:

- Centralized microcomputer acquisition;
- a "help desk" to which users can go for advice and assistance on computing problems;
- user groups on various software products;
- short "consciousness raising" seminars on

THE TROUBLE WITH USERS

Major personal computing problems were identified by 52 MIS managers attending a seminar on information center management. This sample represents a wide cross-section of large- and middle-sized companies from several industries. The managers were presented with a list of possible problem areas and were asked to indicate, on a scale of 1 to 5, their level of concern with each problem: 1. not concerned at all, 2. a little concerned, 3. concerned, 4. very concerned, 5. extremely concerned. They were also instructed to add to the list as they saw fit, and the results were used to tailor the seminar to their needs. Here is the final list of problems. The respective average level of concern is within parentheses.

(4.1) Unnecessary high costs to the company due to users "reinventing the wheel" in systems development.

(4.3) Unnecessary high costs to the company due to users learning by trial and error how to use available software packages.

(2.3) Unnecessary high costs to the company due to users learning by trial and error how to negotiate with vendors.

(2.6) Unnecessary high costs to the company due to users learning by trial and error about lack of compatibility with other micros.

(4.6) Unnecessary high costs to the company due to users learning by trial and error about lack of compatibility with mainframe(s).

(1.7) Unnecessary high costs to the company due to users learning by trial and error about lack of compatibility with microcomputer peripherals.

(4.6) Poor maintainability of user-developed systems.

(3.5) Lack of adequate support from hardware vendors.

(3.2) Lack of adequate support from software vendors.

(4.2) Contamination of corporate data on the company's mainframe.

(4.4) Overwhelming growth of user requests for assistance from the MIS department.

(3.2) Lack of control over user computing resources utilization in user departments by the MIS department.

(3.6) Lack of control over user computing resources utilization in user departments by the user department management.

(3.9) Lack of user knowledge or concern about microcomputer data integrity measures such as a file backup.

(3.1) Lack of user concern about personal computing equipment security.

(1.4) Malicious or unauthorized user behavior regarding company property.

(4.7) Lack of user education regarding a companywide and a long-term perspective about personal computing.

(3.2) Personal computing is further straining MIS department relations with users.

(4.2) Mismatch of user applications to other possible user computing alternatives, such as mainframe packages or the traditional approach for systems development.

(4.8) Lack of a company plan for personal computing.

(4.5) General lack of communication between the MIS department and users.

(3.1) Information overloading due to too many vendors and products in a given area: micros, software packages, local area networks, etc.

(4.2) MIS department has image problem with personal computing users.

(2.9) Lack of integration in MIS management of personal computing and mainframe user computing.

(3.2) Lack of centralized management over corporate data resources to support user personal computing.

(4.2) Lack of equivalent or better (more user-friendly, etc.) mainframe software packages to compete successfully with microcomputer software packages.

(3.7) Inability of mainframe computing to compete with personal computing in terms of cost/benefit in certain areas.

(2.9) Lack of user interest in using personal computers.

(2.1) Measuring the level of user computing activity.

(3.8) Lack of integration of micro/mainframe data exchange and control.

(4.2) Lack of adequate training on products, computer concepts, etc.

(3.2) Lack of appropriate staffing to identify and service potential information center customers.

FIG. 1

APPARENT TRENDS IN PERSONAL COMPUTING BASED ON 96 ORGANIZATIONS SURVEYED (1982-1984)

	1982	1984
Companies with business personal computing	13	68
In the selection and acquisition of personal computers, the MIS department has:		
control over the selection process	2	52
advisory capacity only	6	13
no input	3*	3*
Formal user training program	0	26
Formal help desk	0	33
Company planning for personal computing	0	8
Local area networking	0	12
User groups	2	41
Personal computing library	0	29
Equipment demonstration facilities	2	38

*These organizations are not the same three

The most important change in data management will be the increased level of direct service to personal computing users.

the benefits and problems of personal computing, in which companywide and longterm perspectives are emphasized.

There are some computing processes and managerial tasks that are performed more effectively when integrated throughout the organization and across all user computing alternatives. It is the MIS manager's duty to persuade company management that this integration is needed. Examples of processes amenable to integrated management include dispensing information on overall company computing resources, planning for computing resources acquisition, and matching user information requirements with appropriate computing alternatives.

Many organizations have grown so large that organizational subunits and individuals within these units are completely unaware of the relevant activities of others. This knowledge isolation leads to unnecessary costs. A critical task of the information center is to collect and disseminate information about available computing resources (equipment, user-developed systems, software packages, and data) that can be shared. This requires the centralization of knowledge about all company computing activities, including personal computing.

MASTER PLAN FOR COMPANY

Planning resource acquisition for personal computing and for information centers must be integrated under a master plan for all company computing activities. Future user information requirements can, to a considerable extent, be satisfied by more than one computing alternative. The planning of any one alternative will affect the others. For example, if the MIS department is not aware that a significant number of users will be acquiring personal computers instead of using the terminals attached to the company mainframe, MIS capacity plans will be significantly inaccurate.

Matching users with appropriate computing alternatives, a task totally neglected by phase II information centers, receives great emphasis under the phase III concept. It is imperative that information centers have mechanisms to make prospective computer users aware of alternatives to personal computers and that users' requirements be matched with these alternatives.

Countless personal computer users have spent substantial amounts of time and resources in developing systems (databases) on microcomputers. Only later do they discover severe limitations to a system's ability to evolve and that more powerful tools were available on the company mainframe.

Because good matching requires substantial knowledge of microcomputers as well as mainframe tools, many companies effectively use a committee with two or three members as the matching mechanism.

In early 1982, a survey of 96 northeast Ohio business organizations with gross revenues ranging from $50 million to over $2 billion was undertaken to evaluate the state of user computing. At that time, in 13 of the organizations personal computers were being used for business applications (see Fig. 1). By early 1984, 68 of the same organizations had at least one personal computer being used for the same purposes.

In 1982, four of the MIS departments had some measure of control over the selection and acquisition of personal computers, six had advisory capacity only, and three had no input at all. For 1984, the figures were 52, 13, and three, respectively. The three organizations at which MIS departments had no input in early 1984 now have standard vendor equipment, and users receive considerable support from MIS.

No organization provided any formal training for the users in 1982 compared with 26 companies that now have at least one course related to personal computing.

No organization had a help desk, or used local area networks to share computing resources or to communicate. Now, the figures are 33 and 12, respectively. Two companies had recognized user groups compared with 41 companies today. While no company had a personal computing library before, 29 presently have one. Only two organizations gave hardware and software demonstrations to users compared with today's 38.

These changes—implemented in the last two years—are rated as major successes by the MIS managers. Very likely more companies will find them useful with time.

Besides these trends, some important future developments can be forecast.

In most organizations personal computing users will substantially increase the demand for data resources inside and outside the corporation. MIS departments in the immediate future will have a renewed interest in purchasing data administration tools, such as data base management systems (DBMS) and data dictionaries and directories (DDD).

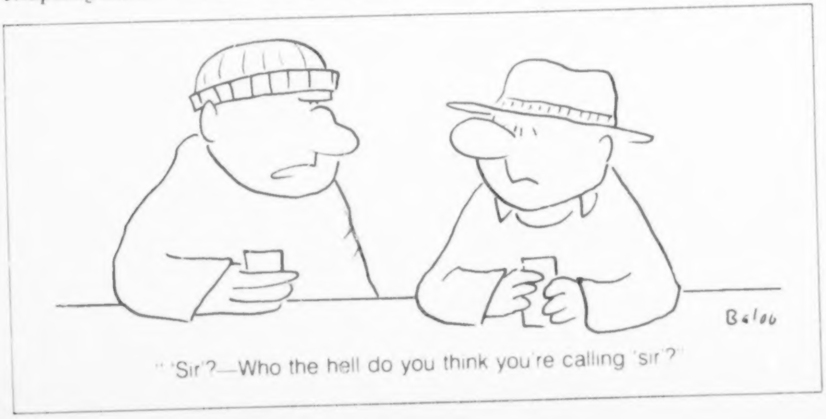
The trend toward substantially more powerful and user-friendly DBMSs, for microcomputers will continue, even though mainframes will remain the dominant store for corporate data.

The most important change in data management will be the increased level of direct service to personal computing users. Dispensing information on data item availability, access requirements, and cost will become a major component of the data administration function. Many MIS departments are planning to include data items on outside databases as part of their service responsibility to their user communities.

An important new development for MIS departments will be methodologies to teach users to define their information requirements. Several new approaches have been tested with promising results. MIS managers feel that having prospective computer users define their own information requirements is in most cases more efficient than asking users to try to communicate their requirements to an analyst. Also, most MIS managers are delighted to see the people-intensive process of information requirements definition shifting toward user departments.

The major obstacle to widespread use of this concept seems to be a generally low credibility of MIS departments with business managers. MIS managers are reluctant to try the exercise on their own and prefer to use an outside consultant. This is likely to be a temporary problem, however. Based on the encouraging results, the idea is likely to spread. It will eventually become common practice in most organizations. ✱

Tor Guimaraes is director of the postgraduate MIS certification program at the Weatherhead School of Management of Case Western Reserve University in Cleveland.



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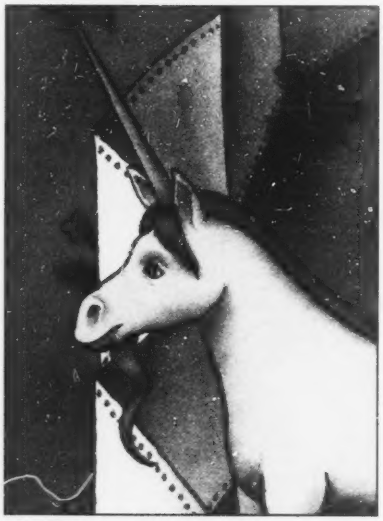

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COVER ILLUSTRATION
BY RICHARD ANDERSON

IBM is the monarch in DATAMATION's ranking of the rulers.

CROWNING EUROPE'S DP ROYALTY

The kings of European data processing saw their empires grow again during 1983, as Europe's dp business continued to shake off the vestiges of recession. The combined revenues in accounting currencies of the DATAMATION Top 25 dp companies in Europe rose a royal 11%, indicating a welcome restoration of strong growth rates after the industry's low point in 1980. Much of this revenue increase is due to a real expansion in the dp business and is not just a result of company mergers and acquisitions—a major factor in the previous year's growth.

That expansion benefited almost every sector of the industry, particularly the telecommunications, software and services, and microcomputer segments. The European business micro market was indeed booming, with shipments worth some $1.7 billion and sales up 52%. This majestic rise of the micro in Europe, however, is not overtly reflected in this year's ranking. The mainframe, minicomputer, and business systems suppliers still dominate in the European dp domain. The signs of change are there, nevertheless. The strongest contender in the European microcomputer market is Apple, which pulled in $137 million in European dp revenue last year.

Predictably, IBM remains the undisputed sovereign of European dp, and its power and influence across the Continent is steadily increasing. Far below IBM, the other members of Europe's dp aristocracy are still battling it out.

Since last year's survey, nine companies have moved up the Top 25 list, while four have slid down. Mergers at France's Bull group helped push the company into the number two spot, despite a $95 million loss last year. Since electronic typewriter sales are now excluded from dp revenues, 1982's top European-owned company, Olivetti, fell to fourth place. French telecom firm CIT Alcatel and West German office equipment supplier Triumph-Adler dropped off the 1983 table completely. The two firms were replaced by the new information technology company formed by Thorn-EMI in the U.K., and Amdahl. The latter reentered the rankings after a year's absence.

The general growth in revenues last year reflects the increasing attention European governments and businesses are paying to data processing. Many Europeans view information technology products as strategic tools that can increase productivity, open up new markets, and encourage economic recovery. Last year, productivity indicators did indeed swing upward in Europe, while interest rates stayed stable at around 8%.

There were still a number of black spots. European unemployment levels remained high and the strong dollar continued to erode the weaker European currencies, although this erosion was less severe than in 1982. Worst hit was Sweden, where the krone dropped 18% against the dollar. The French franc fell 14%, followed by the British pound, which plummeted 14%, and the Italian lire, which was off 11% versus the dollar. The Dutch and West German currencies fared better, with declines of 6% and 5%, respectively. Even though the currency slide seems to be slowing down, it was still bad news for the U.S. companies doing business in Europe. It also took the edge off the results of European companies that had significantly stronger gains in local currencies than in dollars.

Much of Europe's own dp nobility reported sharp rises in revenues and profits in local currencies. Their dollar share of the combined Top 25 dp revenues slipped to 32% last year from 34% in 1982. That loss of domestic market share by European-based companies is about par for the course, according to Morris English, head of the information unit of the Information Technologies Task Force at the European Commission in Brussels. English estimates that Europe had a trade deficit in dp products of some $1.7 billion in 1983. European companies control less than 40% of their home markets, says English, and around 70% of European dp production comes from non-European firms. On a world scale, the situation is equally disturbing. Europe represents just under 30% of the international market for information technology products, yet European-owned firms control only 15% of world markets and this is slipping at the rate of 1% a year.

IBM UPS MARKET SHARE

Back home, IBM is not only seven times bigger than its nearest rival but the blue-blooded giant is gradually increasing its market share. In Europe, IBM once again rang up 10% more sales than the previous year, increasing its slice of the Top 25's total revenues. The company's European sales in 1983 represent 42% of the total $25.6 billion earned by all 25 companies. This compares with 40% in 1982 and 38% in 1981. IBM's increased presence in Europe cannot simply be attributed to the trend by buyers to turn to reliable and established names in troubled financial times. It is also a reflection of how the American company's tactical change over the last couple of years, from cautious ruler to industrial warlord, has paid off handsomely.

The exclusion of electronic typewriters from dp revenues for last year hardly affects IBM, whose estimated $85 million dollar typewriter revenue in Europe is only 0.7% of its total sales. Olivetti, however, which brought in $186 million from typewriter sales, was pushed down two places. Triumph-Adler, which entered the survey ranks in 1982 on the strength of its increased office systems and electronic typewriter business, was eliminated from the Top 25 because of the typewriter exclusion.

Three other companies fell in the 1983 ranking. ITT nosedived four rungs, while both Sperry and Control Data plummeted three places. On the way up the Top 25 ladder were Hewlett-Packard, Wang, and Ferranti—all vaulting three places. The new French Bull group moved up two notches, as did Dutch giant Philips. Inching up one rung were Nixdorf, Honeywell Information Systems, Rank Xerox, and Kienzle.

Another year of dollar dominance has made it necessary to show the highest growth rates of the DATAMATION Top 25 in both dollars (Fig. 1) and accounting currencies (Fig. 2) to give a fair indication of company performance. Amdahl's massive 40% growth in European revenues puts the pcm at the top of the dollar table. Wang captures the number two slot with a 28% sales hike.

When measured in accounting currencies, Amdahl slips to number two behind Sweden's Ericsson, which holds on to first place again this year. The Scandinavian champion is still growing fast, with 1983 sales up an impressive 42%. Meanwhile, Wang dropped to sixth place, below three of Europe's own best performers—Bull and Thomson-CSF from France, and the newly formed thorn-emi (Information Technology) in the U.K.

Seventeen companies in the 1983 ranking showed growth gains on both the dollar and accounting currency tables, in contrast to only 13 in 1982.

There are 12 European companies on the main Top 25 table, one less than the previous year. Britain claims the greatest number of these with four companies, followed by West Germany with three, France with two, and one each for Italy, Sweden, and the Netherlands.

This year, DATAMATION has expanded the table of the top European owned companies. What this shows is that the Continent's software and services companies, especially the French firms, are rapidly gaining in size and strength. Six software companies, along with Triumph-Adler and Racal from the U.K., now fall just below the $163 million revenue cutoff point for the Top 25.

FIG. 1

TOP REVENUE GROWTH RATES IN U.S. $

RANK 1983	RANK 1982	DP % GROWTH RATE*
1 Amdahl	NM	40
2 Wang	4	28
3 Hewlett-Packard	7	18
4 Ericsson Infor. Systems	1	16
5 Nixdorf	6	16
6 Thorn EMI	NM	16
7 Bull		15
8 Thomson-CSF	NM	14
9 Kienzle	NM	13
10 IBM	8	10

*European revenue, FY 1983

NM: not meaningful

FIG. 2

TOP REVENUE GROWTH RATES IN ACTUAL ACCOUNTING CURRENCIES

RANK 1983	RANK 1982	DP % GROWTH RATE*
1 Ericsson Infor. Systems	1	42
2 Amdahl	NM	40
3 Bull	NM	33
4 Thomson-CSF	NM	32
5 Thorn EMI	NM	29
6 Wang	5	28
7 Nixdorf	4	22
8 Hewlett-Packard	10	18
9 Kienzle	8	18
10 ICL	NM	18

*European revenue, FY 1983

NM: not meaningful

FIG. 3

EUROPE'S TOP 20*

	COUNTRY	DP REVENUE IN $MIL.
1 Bull	France	1,378
2 Siemens	W. Germany	1,376
3 Olivetti	Italy	1,305
4 ICL	U. K.	1,016
5 Nixdorf	W. Germany	922
6 Philips	Netherlands	858
7 Thomson-CSF	France	341
8 Ericsson Infor. Systems	Sweden	334
9 Kienzle	W. Germany	278
10 Thorn EMI	U. K.	215
11 Ferranti	U. K.	203
12 Plessey	U. K.	177
13 CISI	France	150
14 SG2	France	142
15 Cap Gemini Sogeti	France	133
16 Triumph Adler	W. Germany	131
17 GSI	France	127
18 Finsiel	Italy	126
19 Scicon	U. K.	123
20 Racal	U. K.	112

*Companies owned and headquartered in Europe

CISI AIMS AT U.S. MARKET

At number 13 on the Top 20 European-owned table is French software company CISI, an offshoot of the French Atomic Energy Agency. The company posted a 5% increase in European revenue to $150 million last year. Around 80% of this revenue comes from France, although like many of Europe's software firms it is trying to establish itself across the Atlantic. CISI has already set up its own operation in the U.S. and in 1983 it branched out into economic information systems with the acquisition of Wharton Econometrics Forecast Associates Inc.

France's Société Générale de Service et de Gestion (SG2), captures the 12th position with revenues of $142 million in 1983. This software firm also gets the bulk (85%) of its business from its French home market. Italy is also a strong earner for SG2, which has a broad customer base covering Africa, Asia, and South America. SG2's main markets are in financial systems, videotex, and networking. Last year it became a member of a development team for one of the projects of the European Commission's European Strategic Program for Research & Development in Information Technologies (Esprit). The effort is designed to set up a Europe-wide packet switching network for information exchange between local networks.

Ranking 15th is the third of France's top software companies, Cap Gemini Sogeti, which boosted its revenues to $133 million. That increase represents a growth of 11% in dollars and a substantial 29% in French francs. CGS began the year by acquiring another French software

DATAMATION'S EUROPEAN TOP 25

1983 RANK	COMPANY	1982 RANK	PARENT COMPANY HQ	EUROPEAN DP REV. CAL. YR. 1983 (IN $ MIL.)	% CHANGE EUROPEAN DP REV. FY 1982/3 (IN $)	% CHANGE EUROPEAN DP REV. FY 1982/3 (IN ACCOUNTING CURRENCIES)	DP REV. DOMESTIC (PARENT CO.) FY 1983 (IN $ MIL.)
1	IBM[1,2]	1	U.S.	10,758	+10.4	+10.4	23,127
2	Bull	4	France	1,378	+14.3	+33.1	*
3	Siemens	3	W. Germany	1,376	+10.0	+17.0	*
4	Olivetti	2	Italy	1,305	NM	NM	573
5	Digital	5	U.S.	1,107	+ 6.9	+ 6.9	2,770
6	ICL	6	U.K.	1,016	+ 2.2	+18.2	776
7	Burroughs[3]	7	U.S.	977	+ 0.7	+ 0.7	2,623
8	Nixdorf	9	W. Germany	922	+15.8	+21.6	516
9	Philips[1]	11	Netherlands	858	+ 9.0	+16.0	*
10	Hewlett Packard	13	U.S.	814	+18.4	+18.4	1,419
11	Sperry	8	U.S.	705	− 7.2	− 7.2	*
12	NCR	12	U.S.	683	− 2.7	− 2.7	*
13	Control Data	10	U.S.	617	−22.3	−22.3	2,900
14	Honeywell[1]	15	U.S.	484	+ 1.3	+ 1.3	1,235
15	Wang	18	U.S.	346	+27.5	+27.5	1,103
16	Thompson-CSF	16	France	341	+14.0	+32.1	*
17	Ericsson Infor Systems	17	Sweden	334	+16.4	+42.2	128
18	Kienzle	19	W. Germany	278	+12.6	+18.3	*
19	Thorn EMI	NM	U.K.	215	+15.9	+29.1	166
20	Rank Xerox[1]	21	U.S.	206	− 2.4	− 2.4	*
21	Ferranti	24	U.K.	203	− 2.5	+11.3	173
22	Amdahl	NM	U.S.	181	+40.3	+40.3	491
23	Plessey[1]	23	U.K.	177	−13.1	+ 0.7	168
24	ITT[1]	20	U.S.	166	−24.5	−24.5	*
25	Data General	25	U.S.	163	+ 3.8	+ 3.8	*

NM: Not meaningful *Not Available [1]Some figures based upon estimates
[2]Dp revenues include all activities [3]Figures for Europe include African revenues
[4]Dp revenues include photocopiers

ny's revenues stem from its local market. It has also been active in exploiting the American arena, as its four U.S. companies accounted for around 25% of its total 1983 revenues.

While Germany's Triumph-Adler dropped out of the Top 25 this year, its revenues still earned it a place (number 16) in the European-owned dp ranking. Its $131 million in sales were predominantly drawn from the small to medium-sized business sector of its home market, while its presence in Italy, France, and the U.K. benefited from money pumped in by parent company Volkswagen.

Number 17 is the fourth French software house to make the DATAMATION table, Groupe Services d'Informatique (GSI). While GSI's $127 million revenues were down 9% in dollar terms, its business grew by 5% in French francs. Software accounts for 95% of the company's sales, with hardware making up the remaining 5%.

Italy's top independent software house Finsiel of Rome fills the 18th slot, with revenues of $12 million. The company confines its business to Italy and showed an 8% growth rate in Italian lire for 1983.

In contrast, it was the European exposure of the U.K.'s leading software and services company, Scicon International, that helped put the firm at position 19. Its $123 million revenue reflected a sterling increase of 14%. Scicon International, a subsidiary of British Petroleum, was formed by the merger of Scicon Consultancy and Scicon Computer Services, and the acquisition of software houses SES in Germany and GFi in France. In fact, France contributed 37% of the company's revenues last year.

At the tail end of the Top 20 European table was the U.K.'s Racal Electronics. Its revenues of $112 million were gleaned from across Europe, although its U.K. operation brought in over half its sales. Racal, whose principal business is data communications products, is now trying to increase its offering in the office automation and expert systems markets.

While each of these European-owned companies is hoping to increase its share of the burgeoning European dp market, each also faces stiff competition from a growing number of strong foreign competitors. Ironically, the future success of many of these European hopefuls is now tied closer than ever to the performance of overseas firms.

LINKUP ROUTE TO SURVIVAL

European companies are finding the best way to survive is to link up with foreign firms in partnerships that offer access to new technologies or new markets. Industrial collaborations such as the agreements between Ericsson and Sperry, ICL and Mitel, Nixdorf and Auragen, and Philips and Control Data are evidence of the team-up trend. Between 1982 and 1983 some 200 cooperative agreements were signed by European companies in the electronics sector. Of these, 50% were with U.S. firms, 20% with the Japanese, and only around 18% with other European companies.

Last year, the most significant transatlantic linkup involved the U.S. telecommunications colossus AT&T International, which is going hell-for-leather to establish a European presence. Following

DP REV. WORLDWIDE FY 1983 (IN $ MIL.)	TOTAL REV. EUROPE FY 1983 (IN $ MIL.)	TOTAL REV. WORLDWIDE FY 1983 (IN $ MIL.)	% CHANGE TOTAL REV. WORLDWIDE FY 1982/3	TOTAL NET INCOME WORLDWIDE FY 1983 (IN $ MIL.)	% CHANGE TOTAL NET INCOME WORLDWIDE Y 1982/3	TOTAL WORLDWIDE EMPLOYEES	YEAR ENDING
35,603	10,758	40,180	+16.9	5,485	+ 24	369,545	Dec.
1,522	1,378	1,522	+22.9	-95	+116	26,000	Dec.
1,376	10,670	15,720	- 7.4	319	- 2	313,000	Sept.
1,637	1,996	2,460	- 0.4	194	+255	47,800	Dec.
4,272	1,075	4,272	+10.1	284	- 32	78,000	June
1,321	1,002	1,321	+ 1.5	60	+107	22,573	Sept.
4,000	977	4,390	+ 4.9	197	+ 67	64,000	Dec.
1,064	922	1,064	+13.1	27	+ 8	17,521	Dec.
1,149	8,757	16,205	+ 0.6	227	+ 40	343,000	Dec.
2,420	1,360	4,710	+10.7	432	+ 13	72,500	Oct.
2,800	1,194	5,076	- 8.9	118	- 47	77,493	Mar.
3,333	842	3,731	+ 5.8	288	+ 23	62,000	Dec.
3,500	830	4,583	+ 5.6	162	+ 5	55,858	Dec.
1,666	1,059	5,753	+ 4.8	231	- 15	93,514	Dec.
1,536	320	1,538	+32.7	152	+ 42	21,700	June
328	*	3,451	-16.6	*	*	65,000	Dec.
458	682	934	+33.0	*	*	19,318	Dec.
316	379	417	+ 5.6	*	*	8,471	Dec.
249	278	328	*	*	*	6,400	Mar.
*	*	*	*	*	*	*	Oct.
222	514	620	+ 5.3	49	+ 20	18,427	Mar.
778	181	778	+68.4	47	+557	6,600	Dec.
287	1,168	1,792	- 2.5	143	+ 3	40,872	Mar.
532	5,835	14,155	- 7.1	675	+ 2	278,000	Dec.
829	164	829	+ 2.9	*	*	15,400	Sept.

its 1982 stake in Irish telecom company Telectron and a joint venture on switching technology with Dutch giant Philips, AT&TI took 25% interest in Italy's Olivetti. This deal, which primarily covers office automation products, is designed to give both companies greater muscle against IBM, especially in Europe.

Japanese companies also regard cooperation with Europeans as the most effective means of entry to the local market. Most of Japan's direct sales operations in Europe are in the areas of components, micros, and consumer electronics. Meanwhile, Japanese mainframes are offered exclusively through local partners. Fujitsu, for example, has ties with ICL and Siemens, and Hitachi sells its systems through BASF and Olivetti.

European dp firms also exhibited a new spirit of Europeanism during 1983. The major mainframers in Europe—ICL, Siemens, and Bull—agreed to set up a joint research institute in West Germany to study advanced processing technologies and share the results of the work. This is the most ambitious industrial collaboration in European dp since the disastrous Unidata project of the early '70s.

These three companies, along with nine others including Nixdorf, Thomson, Olivetti, and Philips, also agreed to adhere to the open systems communications standards determined by the Geneva-based ISO. This move was ostensibly designed to be a counteroffensive to IBM's SNA.

European governments were also anxious to encourage local cooperation, particularly at the R&D level. The pilot phase of the Esprit research program got off the ground last year. Esprit projects will be backed by $1.5 billion from the EEC and industry. One of the most strategic pilot projects calls for the creation of an Esprit Information Exchange System (EIES). Set up by a consortium involving Bull, Olivetti, Siemens, GEC, and ICL, the EIES will link European R&D centers and universities for the exchange of information and ideas. The net will use ISO's standards to connect various types of systems at these sites.

National R&D efforts were also launched last year, starting with the U.K.'s Alvey scheme for research into new technologies. Similar projects in Germany and elsewhere are planned this year. Much of the collaboration focuses on developing new software techniques. This reflects the emphasis European and other manufacturers are putting on building up the local software industry. Europe's software market, which was worth around $9 billion in 1983, is growing at a rate of 11% per year.

The trend toward merging dp and communications was also more in evidence last year. As the traditional distinctions between office machines, word processors, micros, minis, and mainframes blurred, European dp firms continued to revamp their product lines to meet the new challenge. Introductions of PBXs, networking concepts, and on-line services based on new technologies like videotex peppered the industry's calendar last year.

This convergence also made dp companies more aware of what the national telecommunications authorities were doing. In the U.K., the government put its plans to privatize British Telecom on the back burner to avoid interfering with its election campaign. The U.K. PTT neverthe-

The business microcomputer boom has brought both prizes and pitfalls.

less emerged from the initial chaos of market liberalization as a strong competitor in both the dp and telecom sectors. In 1983, it began to offer micros, office systems, and various network services.

PTTS EYE U.K. WITH INTEREST

Other European PTTs, still enjoying their traditional monopolies, watched the U.K. developments with interest. Most of them expect the tide of liberalization to cross the Channel in the not too distant future. Users hope those tides will soon be rising.

Users across Europe have in fact become more critical of the policies of the national telecommunications authorities. The most restrictive PTT, the German Bundespost, continued to come under fire last year for its manipulative market practices, despite its ambitious work in setting up a national videotex system and a broadband network.

In France, the PTT is facing a major overhaul as a result of the government reorganization of the dp and telecom industry. A united Thomson and CIT Alcatel will spearhead the French telecom industry. On the dp front, the government revamp has finally resulted in the establishment of the Bull group. The cornerstone of French dp, Bull consists of CII-Honeywell Bull, Thomson's Sems subsidiary, CIT Alcatel's Transac arm, and the office systems and micro company R2E. This reorganization plus continuing stagnation in the French economy, bred uncertainty among buyers, so business picked up only slightly last year.

Across the Rhine in West Germany, the picture was brighter. German-based subsidiaries and local companies posted healthy revenue gains. The country's dp flagship Siemens, however, is now in some danger of losing its dominant position to the fast growing Nixdorf, whose 1983 worldwide revenues amounted to 76% of Siemens dp take.

In the U.K., business was also good. ICL, Britain's biggest dp vendor, chalked up an 18% increase in pounds sterling. The company seems to be on the road to recovery, although it still has a long way to go before it comes close to IBM's share of the U.K. market.

The U.K. leads the European microcomputer market. At the beginning of the year, there were no less than 100 different pc models being peddled in Britain. Micromania in other parts of Europe has been less intense. But now Germany, the second largest micro market, is rapidly catching up with the U.K.

The business microcomputer boom has brought both prizes and pitfalls. The IBM PC sold steadily but unspectacularly in Europe, while DEC's offerings didn't do as well as those of Apple and Commodore.

Now that business in Europe is picking up, the trend toward micros and communications products is also accelerating. This should open up opportunities for many dp firms doing business on European soil, giving some of the higher flyers a chance to soar into next year's Top 25.

"Would you care to be on my mailing list?"

CARTOON BY MIKE TWOHY

METHODOLOGY

Information for the European Top 25 was solicited through a questionnaire and followed up by independent research by DATAMATION and Logica. For the purposes of this survey, Europe includes Austria, Belgium, Denmark, Finland, France, West Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, and the U.K.

The survey definition of data processing includes the following equipment categories: data communications, peripherals, terminals, software and services, and maintenance and repair. Explicitly excluded are data transmission or "basic" service revenues from specialized common carriers, and standalone electronic and magnetic media for disk and tape drives. All peripherals that attach to a system are included. For computer-based manufacturing systems, like computer-controlled machine tools, only the computer and hardcopy output devices are included and not the machine tool itself.

The main ranking for each company was based on 1983 calendar year revenues (U.S. dollars) from European dp operations. Figures for companies whose fiscal year did not end December 1983 were adjusted using published quarterly figures or estimates. All other figures appearing in this survey relate to the companies' reported results of their fiscal year ending 1983. In the main table, all results have been converted to U.S. dollars, using OECD exchange rate statistics for the appropriate time period. An additional column showing growth rates in actual accounting currencies is included to compensate for the anomalies produced by fluctuating exchange rates.

The rank orders for 1982 are exactly the same as those published last year. Any inaccuracies in last year's table have been corrected and used to calculate the 1982 growth rates. Total revenue figures for Europe and worldwide refer to the parent company, where appropriate. When the parent company itself is not strongly involved in dp, the principal company has been considered as independent.

Several companies such as ITT and Plessey did not provide complete information for the survey, and estimates were therefore made on the basis of published information. ◉

DATAMATION's European Top 25 survey was prepared by Logica, a London-based company that provides international market studies and reports to computer and telecommunications suppliers.

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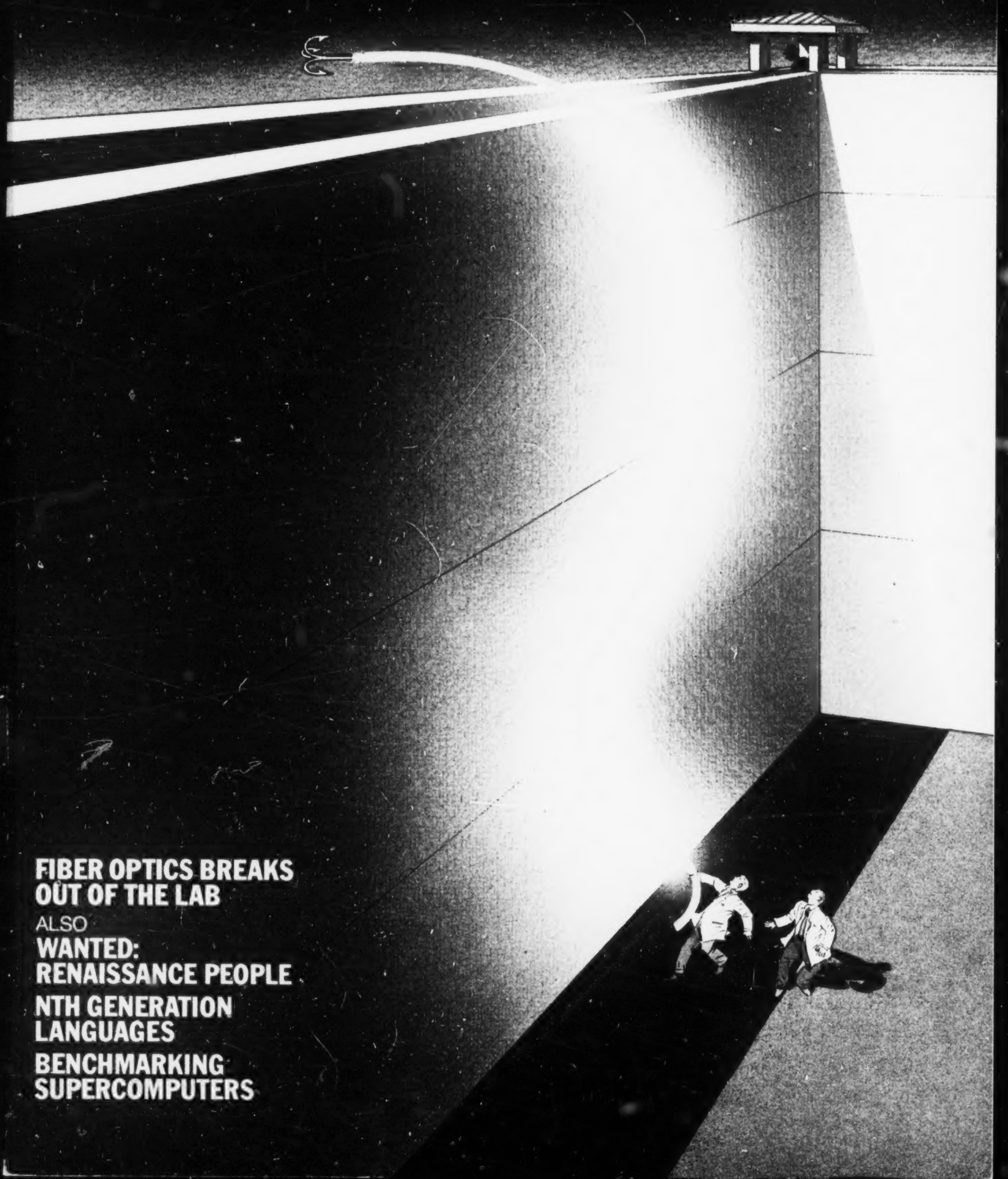

FIBER OPTICS BREAKS OUT OF THE LAB

ALSO

WANTED: RENAISSANCE PEOPLE

NTH GENERATION LANGUAGES

BENCHMARKING SUPERCOMPUTERS

DATAMATION

SEPTEMBER 1 1984/$3.00 U.S.A.
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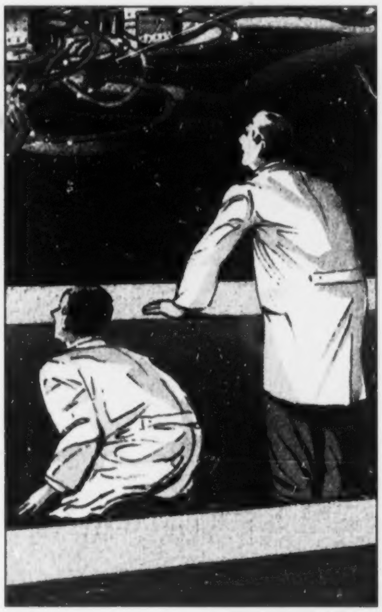

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IN FOCUS

BANKING ON PCs

Will personal computers save home banking?

Edith Myers

It's different strokes for different folks from the people who are bringing us home banking.

For the newest wave of offerings you need a personal computer that communicates. Together, more than 1 million people and small businesses have one or more pcs and a modem.

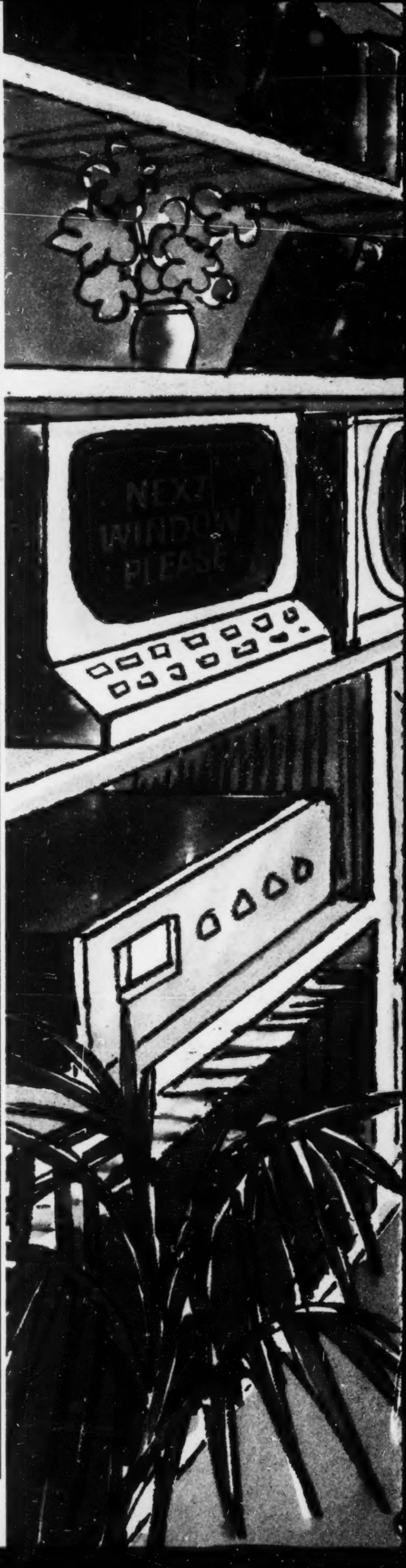
These people are ripe for the picking by such home banking institutions as Bank of America in San Francisco and Chemical Bank in New York. Nineteen financial services organizations, anxious for ways to entice customers with electronic services and simultaneously reduce back office processing costs, are flocking to join the pc bandwagon with bank-at-home offerings.

A host of software houses and service bureaus are also profiting from the pc banking trend. Among the firms who provide bank systems that link up to personal computers are Periphonics Corp., Bohemia, N.Y.; Microperipheral Corp., Redmond, Wash.; and ADP Telephone Computing Services, Seattle.

The bandwagon has its giveaway aspects. Madison National Bank of Washington, D.C., has a pc-based service, and it provides the pc—a Commodore 64 for now, but it plans to offer IBM PCs as well, beginning this month. Broker E.F. Hutton will sell or lease the hardware to access your account.

Some home banking observers, however, are skeptical of the potential in tying the cash vault to the home computer. "I don't believe what I hear about their [pcs] growth capacity," says Kenneth Thacker, president of Strategic Dimensions Ltd., a Toronto consulting firm that specializes in strategic planning for electronic banking. "I think the forecasts are made by the manufacturers." He believes offerings like the Bank of America's will "get the early rush," but not the customer who's difficult to sell to.

Camps are developing among home banking proponents who favor different types of access devices. Thacker favors videotex terminals. "The average customer doesn't want to think computer. He's more comfortable with a videotex terminal, his tv screen, and access to an



infinite number of databases."

He feels the adoption of the NAPLPS (North American Presentation Level Protocol Syntax) by the telephone company ultimately will drive down the price of videotex terminals because "manufacturers [of terminals] now have a blueprint from which to work and they'll start turning them out in quantities with resulting economies of scale.

"If you can deliver that [videotex services] for $20 to $25 a month, consumers will consider it just another add-on to their tvs," says Thacker." Yet the early returns on interest in home banking via videotex are less than encouraging.

Charlie Forbes, vice president of sales and marketing for Chemical Bank's Pronto home banking, with pc offering, quite naturally favors the pc as an access device. "The hardware is in place in the home; $600 to $900 [for a dedicated videotex terminal] is a hell of an investment for something you've never done before."

A 14-bank consortium, Home Banking Interchange, is looking at both NAPLPS videotex terminals and pcs. John Fraser, an officer of First Wisconsin National Bank, Milwaukee, one of the participants, says two tests will be conducted, one with AT&T's Sceptre terminals and a second at a later date with pcs.

The banks signed an agreement in mid-1983 with ADP to install home banking systems for them. In midsummer this year they were just about to turn on the systems, says Fraser. The Sceptre-based systems will be tested for one year with data monitored by ADP and turned over to Mathematica, Princeton, N.J., for analysis.

"The average customer doesn't want to think computer."

Fraser says the planned pc test length has not yet been set. For the Sceptre test the banks each will lend terminals to some 100 to 125 selected customers. "For the pc test we'll be talking to people who already have them," he says. Mathmatica's final report for HBI will include a comparison of the two access modes.

Howard Phillips, president of ADP Telephone Computing Services, says that the final act in the home banking scenario will see a wide mix of access devices. "We'll have everything from rotary dial phones to Touch-Tone phones to ASCII pcs to videotex terminals to bulk feed (where banks use the services of an outside provider), and out there in the Ozarks somewhere, somebody will be using a number 10 tomato can and a string."

Thacker forecasts there will be a coming together of videotex terminals

FIG. 1

BANKING AT HOME SYSTEMS

SERVICE PROVIDER	REGION	NO. OF USERS	PROTOCOL
ADP Telephone Computing Services/Home Banking Interchange	nationwide	2,000	NAPLPS
Anacomp/Videoserv	nationwide	NM*	Prestel
Bank of America/ HomeBanking	California	8,000	ASCII
Chase Manhattan Bank/ Consumer Home Banking	New York	200	ASCII
Chemical Bank/Pronto	New York	11,000	ASCII
Citibank/HomeBase	New York	about 1,000	ASCII
Continental National Bank/ Home Banking System	Miami	200	ASCII
Empire of America, Macrotel/TransTouch	Buffalo	NM*	NAPLPS
Farmers State Bank and Trust, BankWork/Farmers Home Banking	Jacksonville, Ill.	20	ASCII
First Interstate Bank/ Day-and-Night Video Banking	Los Angeles	250	ASCII
Horizon Bancorp/ Horizon Home Banking	New Jersey	NM*	ASCII
Huntington Bank/BankShare	primarily Ohio	NM*	ASCII
Madison National Bank/ Home Teller	Washington, D.C.	300	ASCII
Manufacturers Hanover Trust/NA**	New York	NM*	ASCII NAPLPS
National Bank of Detroit, Applied Communications/ Video Information Provider	Detroit	NM*	Prestel
NCR Universal Credit Union/Companion-at-Home	national	over 100	ASCII
Penn Security Bank & Trust/People Server Videotex Service	Scranton, Pa.	50	ASCII
Shawmut Bank of Boston/ Home Banking	Massachusetts	100 NM*	ASCII
Toledo Trust/VistaBanc	Toledo area	120	ASCII
United States Trust Co./ UST Master Account	New York	70	ASCII
VideoFinancial Services, Viewdata Corp. of America/Applause	south Florida	about 850	NAPLPS

*NM: not meaningful; in startup phase
**NA: not available
SOURCE: "Teleservices Report," reprinted with permission of Arlen Communications Inc., Bethesda, Md.

and pcs. He foresees NAPLPS software that will give the videotex terminals increased capability and eventual building of NAPLPS chips into personal computers. "In five years it'll be difficult to differentiate."

He feels availability of terminals for under $100 "is essential if home banking is ever to really take off." He believes it will happen. "The question is when. We're moving that way. Remember the price you paid for your first television set? Or for your first handheld calculator?"

He's not alone in predicting growth for home banking. A study by the New York research firm Frost & Sullivan titled, "Home Financial Services Delivery Systems," predicts that one in 10 thousand households will utilize electronic home banking by 1991. Fraser of First Wisconsin expects that 10% of all households will be using it by 1990.

John F. Fisher, senior vice president of Bank One Corp., Columbus, Ohio, said at the American Bankers Association's National Operations and Automation (NOAC) conference in Washington, D.C., that the 1990s "will usher in the final development of videobanking technology, preceded in the 1980s by the initial introduction of the technology and development of the standalone home information appliance and the full network."

Home banking, however, was not the hot topic this year at NOAC. Much more attention was paid to things like shared automated teller machines (ATMs) and back office automation.

Floyd Egner, director of the Home Terminal Research Program at Reistad/PSI, Tampa, Fla. (formerly Payment Systems Inc.), says home banking "hasn't generated a lot of excitement in the last six months or so."

Chemical's Forbes believes this is because banks are giving other dp projects higher priority. "Home banking has been something that is moving more slowly than we had anticipated. Shared ATMs to a limited extent, POS [point of sale], and consolidation of back office functions are eating up technical resources."

Talk about home banking has "dragged on to a point that it's tiresome," says Henk Koehn, futurist for Security Pacific National Bank of Los Angeles. "It's going to happen but its unclear what segment of the population it will go to. There's a synergy between VCRs and home computers. [Home banking] will appeal to those types of households."

Koehn believes the ultimate providers of home banking will probably not be banks but third-party vendors. "They're selecting their partners and the first minuet is under way."

THE PC AS STOCKBUYER

Purveyors of most electronic financial services for the home are faced with educating users to doing something in one environment that they have been doing for years in another.

Not so with the independent investors. "Independent investors are very independent. They want to make their own decisions and they're used to initiating transactions from their homes and offices via telephone," says Eric Kobren, director of marketing for Fidelity Investor's Express, an interactive discount brokerage service launched last spring by Fidelity Investments, Boston. It is available to owners of personal computers and dumb terminals.

Kobren himself uses the latter. "It's a $250 Quazon [by Quazon Corp., Carrollton, Texas], which hooks up to my tv and my phone."

Most Investor's Express users, however, use Apple, IBM, and IBM-compatible computers, he says. "Heavy investors have the money to buy computers so their use is the rule rather than the exception."

Fidelity introduced the service with a price tag of $195, but in June cut back to an "introductory" price of $49.95. Kobren said the price would move back up, probably to $95, by the end of this summer. Fidelity is conducting demonstrations of Investor's Express at its 28 investment centers across the country.

Kobren won't say how many subscribers Investor's Express has, only that there are "about several hundred," and that interest has been high both in the U.S. and Europe. He says the most attractive feature to investors is the fact that they can initiate transactions 24 hours a day. "Most of our activity is at night. A lawyer can't buy and sell stocks when he's in a courtroom or a doctor when he's in surgery."

He says customers feel less independent when they buy or sell orders by phone. "Our traders don't try to influence customers over the phone, but when customers are talking to someone, they perceive that they're being talked into or talked out of something." A person placing a buy or sell order at night has the option of changing his mind right up until the market opens.

Software for Investor's Express was developed by Trade*Plus, Palo Alto, Calif., which runs it on DEC VAX computers for Fidelity. Leonard Schwartz, vice president of marketing for Trade*Plus, says his company began offering the brokerage product last year after a year and a half in development.

The first customer for the product was C.D. Anderson, a 10-year-old San Francisco brokerage firm that created a subsidiary, DeskTop Brokerage Inc., to market it not only to brokerage customers but to other brokers on a franchise basis. C.D. Anderson was the first brokerage to offer such an interactive service but DeskTop Brokerage president C. Derek Anderson doesn't feel like a wounded pioneer. "There was a thirst for this type of product," he says. "I know a lot of people who have gone out and purchased modems just to use our service and a few who have bought computers for the same reason."

When he takes the product to market to brokerage houses, probably on Sept. 15, Anderson says he will launch a nationwide promotion for the name DeskTop and he expects potential franchisers will want to take advantage of this.

Do customers ever blame the computer for erroneous transactions? Schwartz of Trade*Plus says this is less likely to happen than with telephone sales. "Brokers tell me that's a big beef with telephone buyers. The stock goes down and they claim they didn't buy. With our system you have a hard-wired trail."

Anderson said his customers make the most use of the system at night and particularly like the fact that they have access to it in case of emergency, "like war or any unforeseen positive or negative news. Usually at times like that all the phones get tied up."

Microperipheral Corp., located in Redmond, Wash., is developing its own system for on-line stock transactions. The system, to be called Stock Mate, is not up as yet. And Michael Darland, president of the company, could not say when it will be up.

The banks will be in there, too. Both Chemical Bank and Madison National Bank of Washington, D.C., have announced they will add stock transactions to their home banking offerings this year.

The stock quotation services are also getting into the act. The Source, the on-line database from Source Telecomputing Corp., McLean, Va., recently announced a deal with a Los Angeles broker, Spear Securities Inc., to supply brokerage services to the 57,000 Source subscribers.

In addition to real-time transaction and confirmation, investors can use the Source for portfolio management. Several brokerage firms are also selling their research to the databases. So far, though, computerized stock buying for the masses seems to be the realm of discount brokerages aiming at independent investors.

—E.M.

One such partnership is between CBS, Sears, and IBM, which announced early this year it would develop a videotex service. "That gives home banking the kind of credibility that will make it go," says Thacker.

Sears in June started a telephone bill paying service in Southern California which it called Stage 1 and which it plans to take national next year. Phillips of ADP says both First Interstate Bank of Los Angeles and Security Pacific are using Stage 1 terminology for their telephone bill paying services.

In mid-1983, Sears chairman Edward R. Telling told stockholders that home banking was a "top priority" for the company. "We have long felt that electronic delivery systems are extremely important to the consumer," he said at an annual meeting. "Automatic teller machines and in-home banking in various forms are a top priority for Sears."

Another major retailer, J.C. Penney Co. Inc., New York, is forming a new venture headed up by Stuart C. MacIntire, who, when he worked with First Bank System Inc., Minneapolis, was instrumental in setting up FirstHand, a home banking experiment in Fargo, N.D. Penney bought the FirstHand system and is lining up partners for a network service which undoubtedly will include home banking.

Egner of Reistad/PSI likes a consortium called Video Financial Services (VFS), which includes, among others, Honeywell, Field Enterprises, and Centel, in Chicago; Viewdata Corp., Miami Beach; Southeast Bank of Florida, Miami; Bank One Corp., Columbus; and Security Pacific. VFS, he says, does software development and transaction processing for the banks involved. It also is the switch and owns the host computer. The first on-line project is the Viewtron offering by Viewdata, a subsidiary of Knight-Ridder, in Miami. A project was being developed for summer introduction involving ASCII terminals from Honeywell that would ultimately include gateways for the use of the NAPLPS standard. Egner estimates involved partners have invested "several million dollars apiece."

"In-home banking in various forms is a top priority for Sears."

Also high on Egner's list is an offering called TranstexT, announced May 31. Its parent is Integrated Communication Service, made up of Control Data Corp., GTE, NCR, Westinghouse, Southern Bell, The Southern Company (a utilities holding company), and "half a dozen smaller partners."

Key to the TranstexT offering is what Egner describes as a gray box—an elaborate meter and also a computer. "With this, a Touch-Tone telephone, and a home tv set, you have a total videotex terminal." The boxes would be installed in a garage or basement by the electric utility companies, which also would do on-line meter reading. First installations were for a beta test starting in June in Roswell, a suburb of Atlanta. It is expected to spread to 200 households this fall, all in the South. Banks involved with TranstexT include North Carolina National Bank; Charlotte Citizens & Southern National Bank, Atlanta; and Fulton Federal Savings & Loan, also in Atlanta, among others.

Egner is a firm believer that home banking as a service cannot stand alone and should be offered with other services. Phillips of ADP is not so sure. He says this is an important question for study in the Home Banking Interchange program. "Maybe people like to read their newspapers, like to go to the store. We want to find out what's important to people. Maybe our entire emphasis should be on banking."

Chemical Bank is continually adding services to its Pronto offering. In April it announced Information Services by which customers can get economic and business briefs, tax guides, *Consumer Reports* articles and a guide to all Chemical Bank services and current interest rates. This was added to the existing services of account maintenance, merchant payments, and electronic mail. At NOAC, Chemical announced it would introduce investment services on Pronto this fall (see box).

Mock of Madison National Bank says his bank will be adding discount brokerage services by the end of this year. Madison's existing services are bill paying, account balance, funds transfer, and loan applications. For the latter, Mock says, a customer can fill out an application via his terminal. "A hardcopy is turned over to the loan office which checks it out. If it's approved we call the customer to come in and sign. Maximum turnaround is five days."

Madison charges a customer $15 a month, which includes the Commodore 64. Chemical charges $12 a month for Pronto, and Bank of America charges $8 per month for its offering. "Cost is important," says Egner. "Customers want to perceive it as replacing an existing cost, say, check service charges."

John Farnsworth of the Private Banking Division of Bank of America and chairman of the Home Financial Services Committee of the Electronic Funds Transfer Association says Chemical Bank and Bank of America are the only two major banks active in the home banking market today. "Citibank's Home Base service hasn't really rolled on yet and Viewtron [the Viewdata service in Florida] is just now adding banking services." Viewtron has five banks offering some form of service through the videotex offering. A recently floated rumor in the New York press indicated that Citibank may try to refocus its home banking experiment toward small businessmen who already have a computer and want better control over their finances. *Citybusiness*, a business newspaper, predicts that new Citicorp chairman John Reed "plans to emphasize desktop services to the commercial market. A far wider range of financial products interests the small businessperson more than the home banking customer," says columnist Daniel Burstein.

Citibank may refocus on small businessmen who already have a pc and want better control over their finances.

Farnsworth, who was with Chemical Bank before joining Bank of America last January and was closely involved with Pronto from its inception, compared the offerings of the two banks. "Pronto has a few additional dimensions to it for the back office end, but because of that, it suffers by being not quite as universal as the Bank of America's." The B of A service will work with virtually any personal computer. Pronto now works with Apple, Commodore, Compaq, and the IBM PC. Chemical is working slowly toward interfacing to other personal computers.

Farnsworth's committee has been in existence 18 months. "We track home banking systems that are quickly evolving all over the country. We also track legislative and regulatory matters but at this point there are no major obstacles to home banking. We want to make sure it stays that way."

What home banking services do customers like best? Mock of Madison National says that far and away it's statement display among his customers. This allows a customer to review his account activity since his last hardcopy statement. "It's used every session, every time a customer accesses the system." He says transfer of funds comes second and bill paying third. Madison has more than 350 vendors signed up to be paid via its system and is adding more all the time.

Bill paying comes in second among Pronto customers, according to Forbes. Chemical has some 1,300 merchants who can be paid and also is adding more regularly. "We'll put on anybody a customer asks for." Among Chemical's Pronto customers, balance inquiry rates number one, but bill paying is a very close second.

Madison, which calls its offering Home Teller, didn't have any problem selecting customers for a pilot program begun last fall with 100 users. "They just walked in and asked for it when we announced we were going to have it," says Mock. He says the bank began promoting the service in May and received more than 900 applications in June.

Selections for tests of home banking have come in for criticism on grounds that there is a selection bias and that often the tests are free and therefore not a valid way to evaluate a service for which charges eventually would be imposed.

Egner of Reistad/PSI, admittedly not a fan of Home Banking Interchange, feels its selection process is particularly suspect. "All members select their own groups and some are even handpicking among their employees."

Fraser, of HBI participant First Wisconsin, says each group selected a random sample of customers and from that sample selected users for the tests. "There were some parameters but we were aiming at getting people from all segments of society."

When HBI moves into its test with pcs, Fraser says, selection will be different. "We'll want people who already have pcs. We'll probably talk to user groups."

Fraser says banks participating in HBI aren't permanently tied to each other or to ADP. "At the end of the study we'll ponder the results; then each bank can do whatever it wants."

They hope the study will show the actual benefits to banks of offering home banking. Many banks feel it will appeal to high-income customers. B of A feels it will recoup the $2 million to $4 million it spent developing its service. Some check handling will be eliminated by electronic bill paying, and some teller time will be saved through electronic funds transfer and statement review.

Indeed, for many bankers the advantage of electronic services for their retail customers centers on the savings in back office costs. "Home banking is one endeavor to offset the costs of the back office," contends Ralph Watson, president of Powerbase Systems Inc., a New York-based micro software house that formerly was solely in the bank dp services business. Its staff was part of the contract programmer team that developed Pronto for Chemical Bank. "Banks have a huge cost of processing paper, and it eliminates key punching and back office paperwork."

For Mock of Madison National the biggest immediate benefit has been new customers. Of the over 900 applications Madison received after promoting Home Teller, he says 80% were from new customers.

"Out there in the Ozarks somewhere, somebody will be using a number 10 tomato can and a string."

Madison is talking licensing agreements for Home Teller to at least three other banks, but with new customer response what it is, Mock won't talk to local [Washington, D.C.] banks. "Why should I?" he asks.

Chemical has licensed eight other banks to use Pronto. They are Crocker National Bank, San Francisco; Manufacturer's National Bank of Detroit; First National Bank of Pennsylvania, Erie; Union Trust Company, Stamford, Conn.; American Security Bank, Washington, D.C.; Bankers Trust of South Carolina, Columbia; Florida National Bank, Jacksonville; and Worthen Bank and Trust Co., Little Rock, Ark. Forbes says Chemical was "talking to a number of others." He predicted in late 1983 that Chemical would sign up 50 licensees by 1985, but at midyear this year he said he would have to revise that downward somewhat.

Current Chemical licensees have what Forbes calls a Phase 1 license allowing them to work with "a couple of hundred customers through our hardware." A Phase 1 license carries a one-time price tag of $25,000 plus maintenance and per customer processing fees. Next step would be a full commercial license for $700,000 plus maintenance and processing. Again, Chemical's Tandem NonStop II processors would handle transactions. Forbes says it is not out of the question that Chemical would consider placing hardware at customer sites at a future date.

Michael Darland, president of Microperipheral Corp., says his company can put a bank into a home banking business where it can make a profit charging customers $5 per month and $3 per connect hour. He says his firm has designed an autodial/autoanswer modem that can be used with any personal computer. It's straight ASCII, he says. "NAPLPS is too costly." The terminals come in two versions, a 17-key model for $175 and a 52-key model for $250. An entire system with 16 ports sells for $86,000 and with 48 ports for $134,000.

Shuttle Corp., a Microperipheral subsidiary, has placed systems in two banks, one in Pennsylvania and one in West Virginia. Darland said in late June that the banks were still testing and didn't want to go public with their systems as yet.

Periphonics claims that more than 250 banks in the U.S. have ordered its pc linking system, which it demonstrated for the first time at this year's NOAC. The system functions with all brands and models of home computers and uses Periphonic's voice response technology, the company says. When a customer calls a bank's computer to start a banking transaction, a human voice greets the caller, asking in multiple choice fashion for the customer's brand of computer, the transaction intended, and the account and security identification code numbers. Customers respond by pushing the buttons on their Touch-Tone phones. A Periphonics official says she is unsure how many of the banks have actually implemented the pc connection.

Phillips of ADP, which is implementing the HBI tests and which offers systems for home banking via telephone or pc or a combination of both to banks in general, likes to think his company has

9:07
ALL MIME RADIO
Leo Cullum

CARTOON BY LEO CULLUM

been into home banking since 1973. The company was started that year to provide home banking via telephone with a service called Pay-By-Phone. "We thought it would take off in two to four years but we made big mistakes. We made it too complicated." Initially, the service allowed customers to handle a variety of trasactions via Touch-Tone phones. When it was scaled back to bill paying only, it gained acceptance. He sees home banking by terminals or pcs as being in a position now of having to proceed a step at a time. "It took 16 to 17 years for consumers to accept ATMs and 25 years for extensive use of credit cards."

It all boils down to selling consumers on the idea, agree watchers and providers of home banking. "You want to make them feel comfortable," says Thacker, who before starting his own company directed electronic banking services for the Bank of Montreal, the only non-U.S. bank in HBI. B of M started a Branch of the Future one and a half years ago; it is constantly updated with new technologies, and customers can come in and play with them. Basically, it's Telidon (the Canadian videotex technology on which NAPLPS is based) married to videodisk. The bank uses a controller manufactured by Pearl Systems, Toronto, to enable its mainframe to talk to videotex terminals. Thacker has high praise for these.

Chemical Bank in early summer was sending out free demonstration diskettes to owners of IBM, Apple, Commodore, and Compaq personal computers so they could become familiar with Pronto's services. Forbes says Chemical could make these demo diskettes available for licensees for their own promotion.

He said in late June that Pronto was being used in 7,500 to 8,000 households in the New York Metropolitan area, "which translates to 11,000 to 12,000 people."

"California's about the best market for pcs. Try New Orleans and you'd be lucky to find five."

Bank of America, the other early leader, had signed up 2,000 customers by June 15 and was looking for 25,000 by year-end. Unlike Chemical, B of A has only financial services, and while it is evaluating other offerings on a continual basis, no plans have been made to add on. Since it owns discount broker Charles Schwab, the opportunity to sell stocks by computer is obvious.

In southern Florida, the granddaddy of videotex services, Viewtron, which started as a test in 1980 and went commercial in 1982, is looking for 5,000 subscribers by the end of the year but, as Farnsworth points out, home banking is a relatively new component. Egner of Reistad/PSI estimates that only 1% of Viewtron subscribers use home banking. He is a subscriber and he does not. "I'd have to go into Miami to open an account to do that."

As for the differences in input devices, Phillips, who believes there always will be differences, says it's like automobiles. "Some people need big powerful cars and others, little sports jobs."

There are those who believe services tied to personal computers will find a geographic tie to their successes. Farnsworth feels B of A's success can be attributed in part to the proliferation of personal computers in California, particularly around Silicon Valley. Thacker notes: "California's about the best market for pcs. Try New Orleans, for example, and you'd be lucky to find five."

Another worry for pc-tied home banking services is the current downgrading by analysts of predictions for the home computer market. Banking isn't going to turn this around. "Nobody's going to buy a home computer just to do banking," says Thacker. ◉

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CIRCLE 3 ON READER CARD

A new survey of dp managers reveals a more relaxed management style and a desire to hire some "know-it-alls."

WANTED: RENAISSANCE PEOPLE

by Andrew Friedman and Joan Greenbaum

In a recent in-depth survey of 95 significant data processing departments, the managers interviewed showed a keen interest in hiring generalists for programming and systems functions. As one manager put it, "We need Renaissance people, who can think and act with an open mind." Generalists, they believe, will fit better into the newly emerging, flexible team structures in which development and maintenance staff, as well as end users, work together from beginning to end of projects. The managers stressed that generalists rather than "techies," have more to contribute to data processing departments.

While user-involved teams staffed with Renaissance-like generalists might sound like a pipe dream, it represents an ideal toward which many managers are apparently working. Quite a few have already put the ideal into practice.

The managers were interviewed for a survey that was part of a four-year international project funded by the British Economic Social Research Council. Interviews were carried out with top data processing managers and/or project managers of large-scale projects at several hundred firms in five countries. The interviews, often lasting three hours or longer, focused on work organization and management strategies for software development. This article looks at the results of the American sample, drawn primarily from the *Directory of Top Computer Executives,* which encompassed departments from as small as three programmers to those employing several hundred programmers and analysts. Firms were randomly selected from the directory and other similar lists. Interestingly, the majority were application shops where COBOL was still dominant, operating in a mainframe environment (see box on p. 136). Results show:

- More than 82% of managers use team or matrix work organization as opposed to the formerly popular large programmer pools. Responding to a question about significant organizational changes over the last five years, a number of managers cited the shift from programmer pools to analyst and programmer teams as a major accomplishment.
- Almost all said they involve users in some or several aspects of software development. While this idea had been given lip service for the past several years, it now appears that users are, in fact, beginning to have their say.
- Formal sign-off procedures with higher management are less frequent than might be expected. Only about 40% of data processing managers said that they use upper management sign-offs to turn a project over to operations, and just half formally sign-off after specifications are complete.
- Demarcations between development and maintenance work appear to be fading away. Fewer than 25% of managers reported that they keep separate departments for development and maintenance functions. Systems and applications, however, are still separate entities, with over two thirds of the firms noting these as distinct departments or groups.
- While time sheets and target setting continue to be recommended methods for evaluating and monitoring software staff, over 90% of the interviewed managers have a strong preference for personal contact to supplement these traditional forms of appraisal.
- Despite the great "GO TO debate" of the 1970s, fewer than 60% of managers in predominantly COBOL shops urge their programmers to avoid GO TO statements. An even smaller number were strongly interested in enforcing any other kind of programming standard such as maximum module size, or standardized module interfaces. The comment of one DPM was typical: "Oh well, we try, but you know. . . ." Another added, "It really makes sense to be flexible about this."
- A bachelor's degree is still the main ticket into programming and systems work, but a large number of managers expressed frustration with the computer science graduates they hired and look with interest to liberal arts or business students. Many indicated that, if given the choice, they would hire from within the company, giving preference to those with demonstrated ability to work well with users and colleagues. Retraining for clerical workers and other people with experience in the company is not uncommon.

VERSATILE TEAMS THE RULE

Small, versatile project teams are the rule for maintenance work as well as new project development. In most firms, project members work on more than one project at a time and, not surprisingly, serve on more than one team at a time. As experience has shown, teams that work well together stay together. About 65% of teams stay together beyond the length of a project; in midsize departments of 10 to 29 programmers/analysts, about 75% of teams stay together longer than one project.

Three quarters of all project teams have fewer than six members. Interestingly, the older title distinctions, such as programmer, senior programmer, and analyst, don't seem important in determining team makeup. The surveyed firms most often lump programmers and analysts together.

ILLUSTRATION BY RICHARD BOBER

Many managers reported that they prefer the term "analyst/programmer" rather than individual titles, since workers function in both ways within the teams.

While the 1960s and '70s saw the rise of the programmer pool concept for large COBOL shops, particularly for maintenance, managers now appear to be pleased that they are moving away from this model. Only about 20% of the sample reported using programmer pools, a percentage that was the same for maintenance and new development work. They felt that teams and matrix structures give them the chance to organize their work force to suit the needs of a particular project, while simultaneously giving programmers and analysts more of a hand in developing or maintaining a whole project. Certainly, the cry of programmers to participate in more aspects of project development is one of the factors moving them out of pools and into more adaptable team organizations.

Formal sign-off procedures at traditional milestones in project development appear to be far less important in practice than they are in theory. When sign-off procedures are used, checking with users carries more weight than reporting to upper management. To a question asking managers to indicate at which points in project development they seek clearance before doing further work (i.e., functional specification, system specification, detailed design, coding and debugging, and testing and operations), the managers responded that they are more likely to check validity with users than they are with their corporate superiors. In either case, however, formal sign-offs are not particularly popular.

Only about half of the surveyed managers said that they formally report to higher management at the end of functional or systems specifications, while 80% of firms check the validity of functional specifications with users before continuing a project. Around 70% of managers reported that they check the validity of a system with users before it is turned over to operations. These reports directly contradict management theories about the need for formal project milestones, yet come as no surprise to managers engaged in the day-to-day details of running a project.

FIG. 1

NUMBER OF FIRMS INCLUDED IN SURVEY BY TYPE AND SIZE (95 FIRMS)

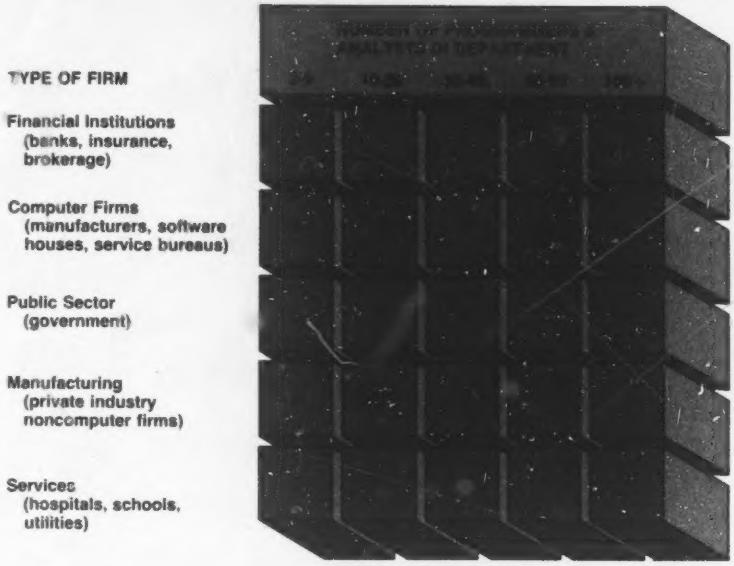
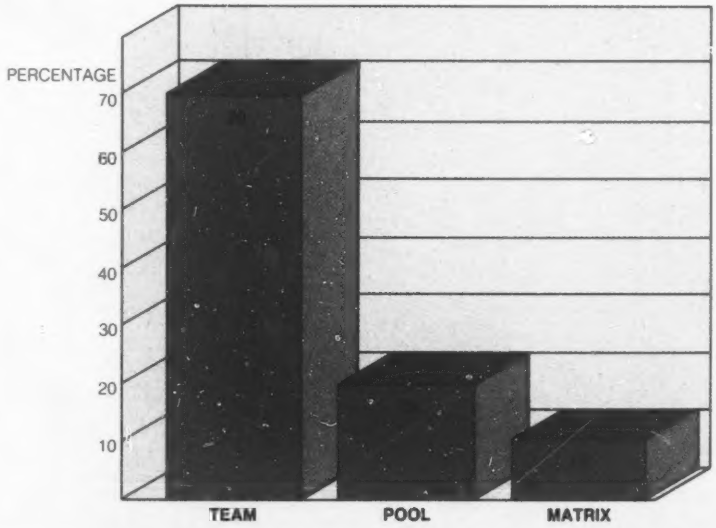


FIG. 2

ORGANIZATION OF PROGRAMMERS & ANALYSTS



(Q. 16) What best describes the organization of your development staff?

CLEARLY MARKED STAGES

Management journals have stressed the need for clearly marked stages in project development and have delineated tasks for different software specialists, but this division of labor no longer appears to be as important as it once was. Working together in project teams, systems analysts, programmer/analysts, and programmers tend to overlap in job function. Similarly, an overlap of project milestones is apparent:

- Fewer than 30% of managers said that they change personnel at sign-off points within a project, signifying the strength of project teams and the lack of clearly marked project milestones;
- Only 10% of firms change day-to-day responsibility between design and coding, perhaps a further indication that teams develop their own internal work organization.

The interviewed managers were remarkably candid. While most programmers and analysts know that "things are not done by the book," the survey is an open admission of a more relaxed attitude toward work organization.

The survey is an open admission of a more relaxed attitude toward work organization.

The questionnaire, originally developed for use in the United Kingdom, also asked if managers imposed a set of design and coding on programmers and analysts. Almost unanimously, American managers responded that they do not "impose" standards, probably reflecting the fact that this type of strict enforcement seems to go against the American self-image. Even with further questioning on this point, less than 60% of managers said that they use standards to limit GO TO statements, and a similar number admitted that they require formatted specifications for input/output and program layout. To a separate question asking if there were department standards for program specification, only half of the managers responded affirmatively.

It's hard to say whether standards are indeed enforced without much enthusiasm, or whether it has become fashionable for managers to appear relaxed in their management style. As might be expected, first-line managers and project leaders who are closer to shop-floor practices are more likely than DPMs to expect programming standards. And, it was suggested that strict enforcement was no longer so necessary, since newer programmers have been schooled in structured code and therefore don't need to have their hands held to avoid GO TO situations.

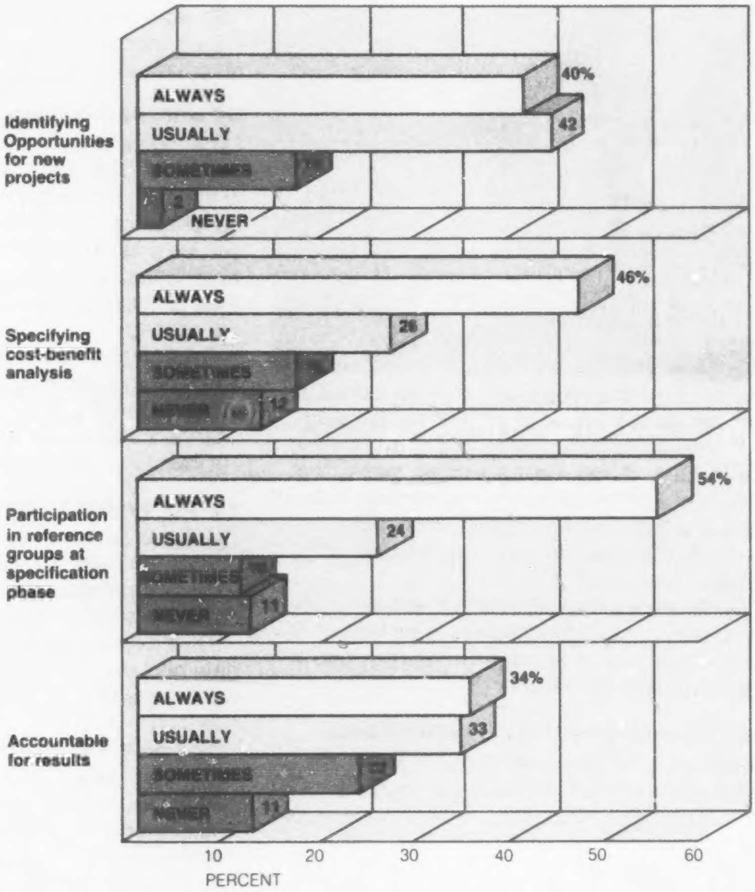
While management journals have spent the better part of the last decade hammering home the enforcement of standards, most software people know that strict adherence to rules is rare. Many managers, however, commented that they would like to see better enforcement of department programming standards. Some went as far as to say that it was a top priority for them, though overall, interviewers got the sense that management theory and shop-floor practice are strikingly different.

Management methods for monitoring and evaluating staff are also varied, but here managers appear to exert more control. Almost all use some recognized procedure for appraising individual performance, such as time sheets, work targets, and formal employee evaluation sessions. About 90% of managers said that they involve programmers and analysts in setting target dates for project phases, although most managers do not let staff pick their own projects.

On the whole, managers prefer to evaluate workers on the basis of how well target dates are met, rather than on the basis of time sheets. Many said that time sheets are merely paperwork, important for keeping upper management happy, but not particularly useful for monitoring the progress of programmers.

FIG. 3

USER ACTIVITY



(Q. 8) To what extent are users normally involved in development of new applications in their area?

Managers were quick to point out that now, as in the past, "experience and achievement are more important than a degree." Forty percent of the sampled firms indicated that they have hired programmers with less than two years of experience, but most preferred programmers with at least two years of experience under their belts.

Since many managers want to hire people who can communicate well with users, generalists are in demand. One manager explained that he would prefer to recruit "application analysts"—people with business experience who could understand users' needs and envision a whole application. While a computer science degree is still a big favorite in corporate personnel departments, many managers said that, if given their own choice, they would seek out liberal arts graduates and people interested in problem solving. Two to one, managers prefer degrees in subjects other than computer science. They stressed, however, that hiring technically proficient people is still essential.

LABOR TURNOVER STILL BIG

Labor turnover, particularly among programmers and analysts with two to five years of experience, continues to be an issue. The survey

There is a major contrast between management's actual practice and the "correct" policy of management theory.

showed that, during the last three years, large firms had a turnover rate of nearly 100% for workers in this experience bracket. With the demand for banking applications, job hopping was most common for programmers and analysts in financial firms. But mangers seemed to be less worried about job hoppers than they were in the past, apparently because the pool of possible replacements is now so large.

Because the supply of graduates far exceeds the current demand, breaking into programming is hard. While there might be a demand for Renaissance-type programmer/analysts, it certainly is not a Renaissance period for entry-level programmers.

In general, managers said that they are pleased that users are getting more involved in identifying opportunities and participating in the specification phase of projects. Many managers indicated that as users get more sophisticated, some data processing woes might ease.

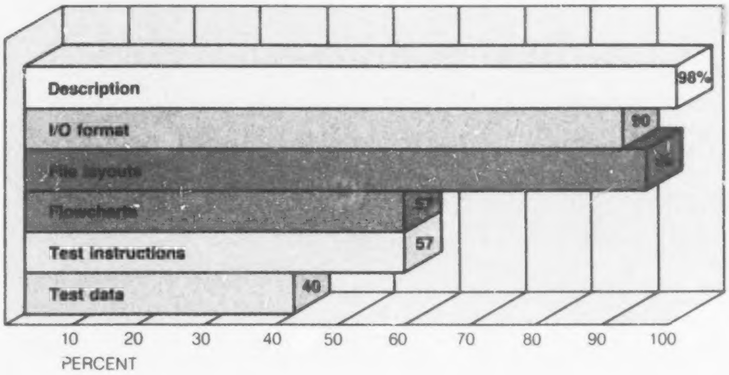
But user sophistication is a double-edged sword. Some managers complained that users have increased input in defining projects, but have not accepted additional responsibility for results. In a question asking if users were held accountable for results, the overwhelming majority of DPMs said that this was rarely the case. The glory or shame that goes with a project's outcome is still the dp department's domain.

Users are almost always involved in some phase of project development, but the introduction of micros into user departments has cast many DPMs into uncharted waters. As users get micros and begin their own projects, data processing managers are sometimes called in to bail them out. In many instances, managers feel that downloading some current work onto user micros would be a good idea. A number of managers expressed delight at the idea of shedding the drudgery associated with maintenance and enhancement of existing systems, but DPMs are searching for a way to control this process. Indeed, most companies do not yet have policies for dividing work between the data processing department and user areas.

Three major firms in our sample attempt to navigate around this problem by merging user and dp functions into new groups.[1] One large insurance company integrated its claim processing applications for one contract type under the auspices of a combined dp/user management team. A very large bank did the same thing with a number of functions, continuing a trend that has affected banks for several years. And a major computer manufacturer took all of its internal corporate functions and reorganized them into 10-person dp/user teams. These teams combined programmers, analysts, and user-specialists under data processing managers. What is unique in these instances is not the fact that users are involved in dp activities, but rather the way in which user activities have become part of the dp department or group. Whether these become models for moderately sized firms will be worth watching for as users gain pc power.

FIG. 4

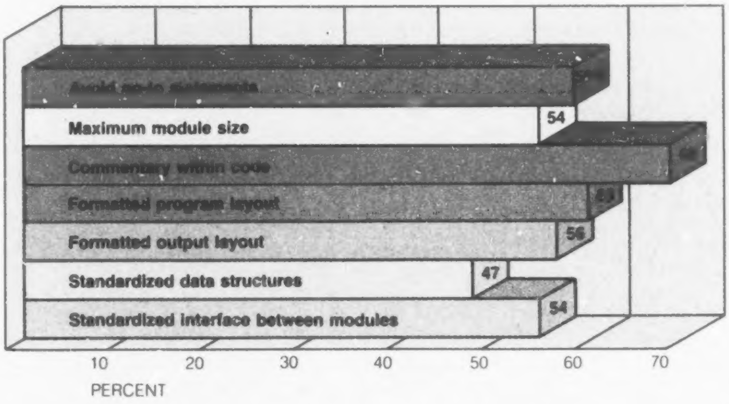
SPECIFICATION STANDARDS



(Q. 28) Of the firms requiring standards specifications, the above represent the percentage of firms including this documentation in their specifications.

FIG. 5

DESIGN & CODING STANDARDS



(Q. 27) Do you impose any (of the above) design and coding standards in your department?

We see a major contrast in this survey between management's actual practice and the perhaps outdated "correct" policy of management theory. Rather than pursue "direct control"[2] over the data processing

---

[1] Since the lengthy questionnaire contained some sensitive questions, all 95 firms in the U.S. sample were promised anonymity.

[2] "Direct control" and "responsible autonomy" are terms used in Andrew Friedman's book Industry and Labour. The responsible autonomy style was identified in other work settings.

Sophisticated users will be both boon and bane for the data processing professional.

task assignment, data processing managers have been developing a culture of "responsibility autonomy," in which employees are given considerable responsibility over their work and are expected to perform well over a wide range of work tasks.

DP LABOR DIVISIONS BLURRED

The detailed results of the survey reveal a blurring of traditional boundaries in the division of data processing labor. The emphasis on programmer/analysts as central figures in the organization is interesting: while traditional titles and job ladders still bear much weight, management relies more and more on workers who do some of both. We found, for example, that 95% of the time management expects that the person doing the coding will be involved in writing the specifications as well. Rather than parcel out pieces of work, assembly-line fashion, managers prefer to control task sizes by informal guidelines. Thus, standards like "maximum module size" or "expected lines of code" were rarely viewed as important in shaping the progress of a project.

Team organization may offer programmers and analysts more opportunity to see a project from conception through to implementation. Managers believe that there is more assurance that a job will be done well if the participants are more fully involved. Clearly, teams give management the flexibility to move staff around where needed. Seventy-four percent of teams were found to be working on more than one project at a time. This is clearly where generalists and Renaissance people fit in. Amidst a shifting landscape where the only certainty is constant change, programmers who can function as analysts and communicate with users are welcome assets.

User involvement in areas that have traditionally been data processing strongholds is speeding evolution. Both the programmer/analyst structure and team organization are flexible and responsive to the user onslaught. The generalist is yet another figure who can help the data processing department adapt to change. A pattern of informal guidelines and flexible standards is strengthening the image of a data processing work organization that is prepared for change.

From the survey, we see the development of a management culture of responsible autonomy in which flexibility is achieved through careful adaptation. Managers are discarding their traditional watchdog role. They are prepared to exchange direct control of staff and the work process for the flexibility they need in order to retain their balance in the shifting corporate picture.

Within this almost idyllic scene, the shape of future problems is evident. Sophisticated users, with manuals in hand, will be both boon and bane for the data processing professional. Offering users new services, while relinquishing control over some existing prerogatives, will be a difficult parlay. Another problem will be posed by the employee trained in computer science. Technicians geared toward elegant solutions will have difficulty understanding the unstructured problems posed by the new setting.

And finally, new forms of communication will be crucial among expanding data processing departments and new user groupings within the organization. The flexibility that the British Economic Social Research Council study revealed to exist in the organization of data processing departments may, however, save the day. ◉

C.I.A
ETHICS
COMMITTEE

"Say, where the hell did *that* come from?"

CARTOON BY SIDNEY HARRIS

Andrew Friedman teaches economics at the University of Bristol in England. He is the author of *Industry and Labour*, as well as of several articles on work organization in computing. Further inquiries about the survey reported in this article should be addressed to him in England, where he is head of the Data Processing Research Project at the Economics Department, University of Bristol.

Joan Greenbaum is an assistant professor of data processing at LaGuardia Community College in New York (CUNY). She is author of the book *In the Name of Efficiency* (Temple University Press, 1979) and frequently lectures about technology and social change.

The survey was conducted in the summer of 1983 through the International Computer Occupations Network (ICON). ICON project members in New York included Christine D'Onofrio, Persephone Flood, Karen Edwards, Michael Jacobs, and Joe Kirshner. The authors wish to acknowledge the special contribution of Michael Jacobs to the compilation of this article.

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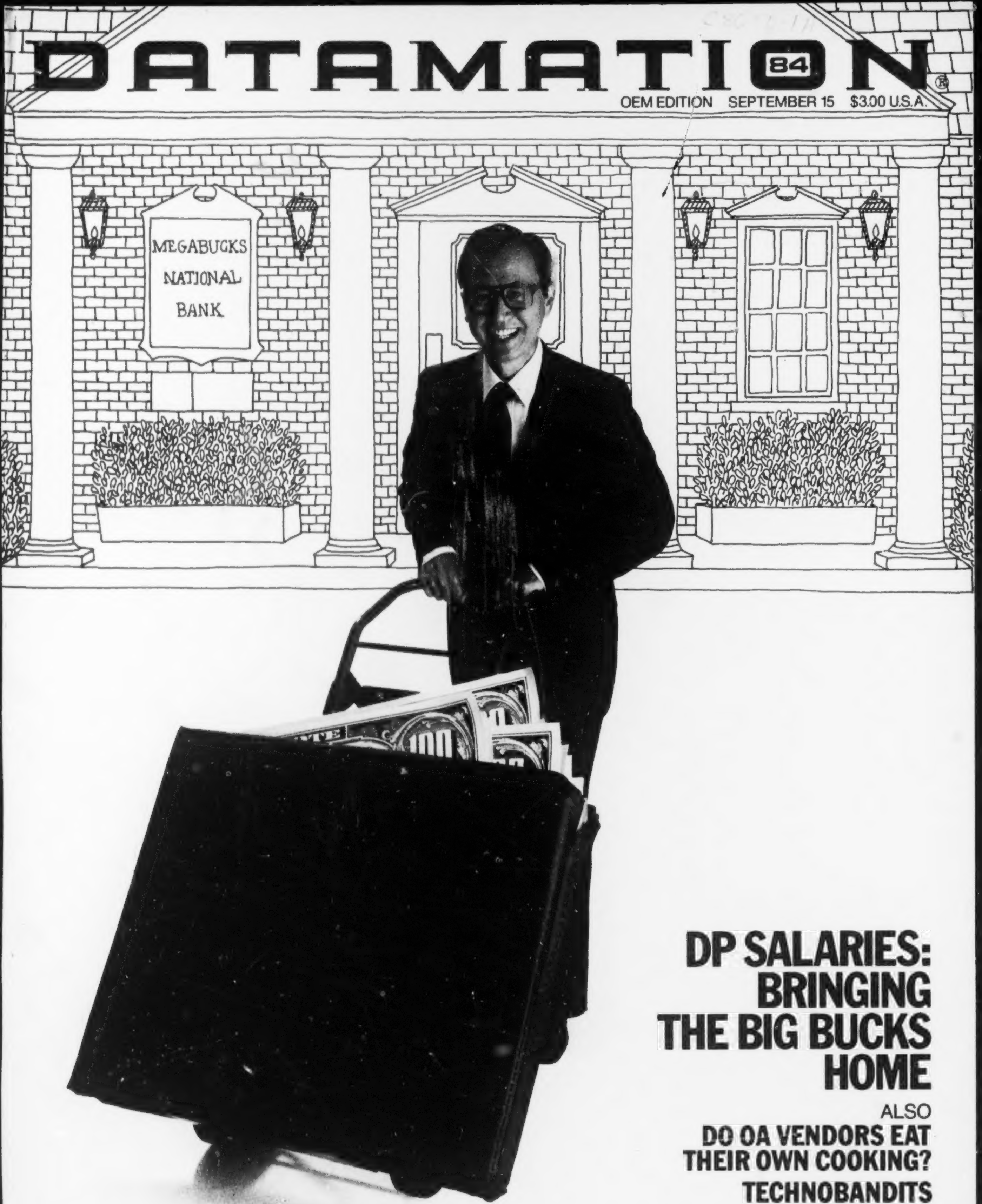
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DP SALARIES: BRINGING THE BIG BUCKS HOME

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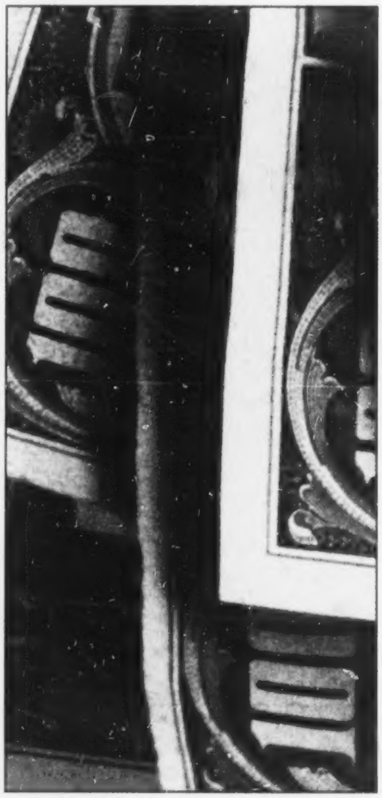

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COVER PHOTOGRAPH BY JOEL WHITE;
ILLUSTRATION BY SUSAN HUNT YULE

A tighter dp job market means even fatter paychecks are coming.

THE BIG WALLET ERA

by Larry Marion

The telephones started ringing off their hooks in April. At first the calls caught data processing managers by surprise, then they became annoying, and now they are more entertaining than anything else. After years of little demand, a legion of headhunters is making cold calls to dp shops around the country, trying to find programmers, analysts, telecommunication experts, and others.

"These people are very creative with their b.s. stories," relates William Sumner, director of management information systems for the Bullock's chain of department stores in Southern California. "It is fun listening to them."

Here's a sampler of what Sumner and his staff have heard over the past few months:

" 'Hello, I'm doing a survey on programming opportunities for women. I want to send questionnaires to all the women programmers at your organization, and I need their names and addresses.'

"Another time, a guy called the computer room, described himself as the editor of an IBM publication, and claimed he was in big trouble because he had lost a mailing list. He said he was in fear of his job if he didn't get a list of on-line programmers.

"God bless him, somebody here gave him the list. The next day the phones rang off the hook.

"You name it, we've heard it when it comes to cons. It's funny and it's flattering," Sumner says, and goes on to repeat other tales of brazen headhunters.

In case you haven't noticed, things are heating up. The economic recovery is bringing better times to many corporations, and their dp departments are expanding. It's not an across-the-board boom just yet, but the signals of critical skills shortages are clearly there. And just as an IF statement is followed by a THEN statement, in-

PHOTOGRAPHS BY JOEL WHITE

creased demand for experienced dp personnel inflates salaries in a classic supply and demand spiral.

The big wallet era is coming, warns the New York-based vice president of management information services for an international financial services firm. "Many dp managers saw the leveling off of the steep climb in dp salaries and thought it meant the end of an era," he says. "That was a pause, not the beginning of a new trend." Adds Daniel Roberts, manager of the management consulting department at the accounting firm of Deloitte, Haskins & Sells, Los Angeles, "Companies are trying to maintain control, not like 1977, '78, and '79, when they were adding as many as they could."

Evidence of the higher salaries, growth, and subsequent increase in turnover rates comes from the DATAMATION salary survey, which has just been completed. Earlier this year, more than 700 dp managers from across the country estimated that the average salary increase this year would be 7.8% compared to 1983, up from the 7.2% awarded in the prior year.

Managers of large shops, with annual budgets of more than $1 million, estimate that their raises will be even higher, as head counts will soar up to 20% this year and the sharp increase in demand will lead to at least a 9% turnover rate. Managers of smaller shops estimate more modest staff growth and revenue increases, but the overall trend is clear.

Double-digit raises are expected to be typical of computer centers in certain industries such as edp and financial services. Banks are also fattening the wallets of their dp employees, judging by the 9.6% raises estimated by their dp managers. The increase in consumer spending for appliances, furniture, and other household items is showing up in the 8.3% increase in dp salaries for dp personnel of the manufacturers of consumer products.

WIDE-RANGING AVERAGES

Before you run into the boss's office and demand an 8% raise, consider that these gross averages cover an especially wide range of conditions. Some industry and regional compensation, growth, and turnover rates are declining, while others are flat. Not all dp managers are stuffing pay envelopes with large quantities of extra currency these days. The uneven economic recovery—some industries and regions are doing far better than others, coupled with a mild inflation rate—means that a broad survey average blurs much of the day-to-day reality.

For example, there's bad news for

METHODOLOGY

The 1984 DATAMATION salary survey began in June with a letter sent to 5,000 dp centers in the United States, drawn at random from the magazine's list of the top official at each of the 60,000 computer sites identified from the subscription list. Enclosed with the letter was a five-page questionnaire and a small financial incentive.

Seven hundred fifteen key officials completed the questionnaires, which asked for the current annual salaries of 43 separate dp positions; most of the responses came from dp managers, though many were completed by the personnel office. In addition, the questionnaires inquired about staff growth, the average percentage salary increase, and turnover rates last year and this year.

Of the 715 respondents, most were from major population centers, including Boston, New York, Philadelphia, Detroit, Baltimore/Washington, D.C., Atlanta, Denver, Houston, Dallas, Chicago, Minneapolis/St. Paul, Cleveland, Cincinnati/Columbus, St. Louis, Seattle, Los Angeles, and San Francisco. Because of its size, the New York labor market was further divided into two segments: Manhattan and the other boroughs and suburbs.

Most of the dp shops responding to the survey had an annual dp budget of $500,000 or less, and an average head count of more than 13 individuals.

The respondents' questionnaires were also sorted by principal activity of the dp department's parent organization. The largest segment, about 30%, was made up of manufacturing organizations; followed by the miscellaneous segment, 15%; dp services, 13%; distributors, 11%; education, 7%; business services and government, 6%. Other categories included in the survey are banking, other financial services, medical/legal, and transportation and utilities.

—L.M.

JOB DESCRIPTION GUIDE

Respondents to the salary survey matched, as closely as possible, their staff categories to the following job descriptions.

Vice president: The senior executive for all corporate information systems. Responsible for long-range planning, budgeting, and operations.

Director of dp: In charge of all dp at the divisional or departmental level. Responsibilities parallel those of corporate officers, but may be at least partially guided by decisions made at corporate level.

Services coordinator/user liaison: Works for dp department and end users; represents users when operational problems occur.

For the seniority levels in each of the following categories, refer to the section on job levels below.

Systems analysis: Confers with users to define and formulate logical statements of business problems and devise procedures for solutions through use of dp systems.

Applications programming: Develops, designs, and prepares computer programs.

Systems analysis/programming: Performs the functions of both the systems analysis and applications programming positions.

Operating systems programming: Programs, maintains, and introduces modifications to systems software.

Computer operations: In charge of equipment, data entry, production control, and postprocessing, but not of systems analysis, application programming, or other development functions.

Production and I/O: Sets up and schedules jobs for processing so as to maximize and control utilization and meet turnaround requirements.

Data entry: Perform data entry and verification functions.

Office automation: Operation of word processing equipment, intelligent typewriters, terminals for text editing/word processing.

JOB LEVELS

Manager: Advanced degree and minimum five years experience or equivalent combinations. Performs personnel evaluations, budgeting, progress reporting, and project management.

Lead: Bachelor's degree or equivalent and minimum four years experience in dp with two of those years in a supervisory capacity. Performs all levels of supervision, generally as a project manager.

Senior: Bachelor's degree or equivalent and minimum three years experience including some supervision.

Intermediate: Bachelor's degree or equivalent and minimum two years experience. Requires direction on some activities.

Junior: Two to four years college and minimum six months experience or equivalent combination. Directly supervised.

FIG. 1

ANNUAL SALARY INCREASES AND TURNOVER RATES IN 1984, BY INDUSTRY

(IN PERCENT)

	AVER.	MFG. CONS.	MFG. IND.	BANK	FIN	EDP	OTHR SERV	DIST	GOVT	MED/ LEGL	TRAN UTIL	EDUC
Salary	7.8	8.3	6.7	9.6	10.9	11.3	8.9	6.9	6.2	7.9	5.7	5.5
Turnover	4.4	4.1	3.4	7.8	4.8	6.4	4.6	4.0	3.8	5.3	4.7	2.8

FIG. 2

ANNUAL SALARY INCREASES AND TURNOVER RATES IN 1984, BY REGION

(IN PERCENT)

	AVER.	BOSTON	MANHAT	NYC	PHILA	WASH/ BALTI	ATLNTA	DALLAS
Salary	7.8	9.7	10.4	7.3	7.1	7.0	7.9	7.0
Turnover	4.4	5.1	6.6	8.7	2.7	2.7	3.2	2.0

	CHICAGO	MINN	CLEVE	CINCIN/ COLUMB	DETROIT	SAN FRAN	LOS ANGELES
Salary	7.9	6.7	5.8	8.0	8.0	7.6	12.3
Turnover	5.5	0.8	2.4	4.1	3.8	5.5	3.7

dp shops that share one trait—oversight by the federal government. Paltry raises come from the utility, transportation, and education sectors—nuclear power woes, airline fare wars, and Reagan Administration cutbacks in funding for schools are but a few of the regulatory traumas taking their toll, with average dp salary increases of 5.7% for the utility and transportation sectors and 5.5% for education.

Below-average salary increases are not surprising in areas like Cleveland, still trying to recover from the recession's wounds and with loads of unemployed casualties to pick from. Minneapolis and Seattle are other areas where dpers won't have to go out and buy stronger wallets to hold their paychecks.

A consolation for dpers in industries and areas where below-average raises are expected: compared to American workers as a group, dp personnel are not going to do too badly this year.

The average wage rate increase for American workers in 1983 was 3.3% and is expected to rise to a mere 5.3% this year, according to economists at Wharton Econometric Research Associates, Philadelphia. Dp personnel are even expected to do better than the average American executive, according to a recent survey by Sibson & Co., Princeton, N.J.—the increase in base salary this year for executives is expected to run around 7%, although the profit sharing and other executive bonuses will increase their total compensation to the 11% range. Even in the rarefied air of the largest American corporations, there are indications that overall salary increases

FIG. 3

AVERAGE ANNUAL DP SALARIES BY INSTALLATION SIZE

JOB TITLE	ALL	OVER $1 MIL	UNDER $1 MIL
Vice President	47,562	67,650	44,772
Director of DP or MIS	36,264	49,158	35,155
Service Coordination/User Liaison	27,794	27,949	26,881
Manager of Systems Analysis	37,526	41,500	36,484
Senior Systems Analyst	35,671	35,100	35,456
System Analyst	26,420	28,278	26,265
Manager of Applications Programming	33,131	42,700	31,548
Lead Applications Programmer	29,756	38,143	27,728
Senior Applications Programmer	26,900	33,425	25,425
Applications Programmer	22,121	25,692	21,286
Junior Applications Programmer	16,907	19,530	16,536
Systems Analysis/Programming Manager	32,378	40,885	30,148
Lead Systems Analyst/Programmer	33,714	46,028	30,874
Senior Systems Analyst/Programmer	30,461	34,992	28,647
Systems Analyst/Programmer	25,123	28,478	23,842
Manager of Operating Sys. Programming	34,877	43,934	30,651
Senior Systems Programmer	33,947	35,102	32,800
Manager of Database Administration	29,850	55,000	26,706
Manager of Computer Operations	24,071	31,080	23,240
Shift Supervisor	20,237	20,864	20,241
Lead Computer Operator	17,416	19,314	17,091
Computer Operator	14,685	15,626	14,588
Control Clerk	13,867	14,518	13,595
Data Entry Supervisor	15,875	18,500	15,835
Data Entry Operator	13,012	12,740	13,054
Word Processing Supervisor	17,750	24,750	17,086
Word Processing Operator	14,435	17,537	14,230

FIG. 4

AVERAGE SALARY BY INDUSTRY (IN $)

TITLE	MFG ALL	MFG CON	IND	BANK	FINANC	EDP
Vice President	47,562	42,512	47,500	63,500	39,075	51,015
Director of DP/MIS	36,264	35,004	35,316	47,333	39,686	51,000
Services Coordination/User Liaison	27,794	26,750	24,833	24,360	NA	34,966
Manager	37,526	35,250	33,200	52,000	46,000	40,944
Senior Systems Analyst	35,671	29,000	32,500	32,500	39,000	42,120
Systems Analyst	26,420	27,000	27,220	30,000	32,000	28,750
Manager of Applications Programming	33,131	31,167	37,500	55,000	33,333	37,950
Lead Applications Programmer	29,756	26,375	27,750	NA	26,500	35,538
Senior Applications Programmer	26,900	26,583	26,974	44,000	22,167	32,292
Applications Programmer	22,121	19,740	22,138	23,000	20,500	23,483
Junior Applications Programmer	16,907	16,236	17,111	NA	18,833	19,667
Manager of Systems Analysis/Programming	32,378	29,667	31,194	NA	29,728	38,697
Lead Systems Analyst/Programmer	33,714	28,750	29,333	NA	25,800	40,857
Senior Systems Analyst/Programmer	30,461	28,540	27,068	NA	26,658	39,133
Systems Analyst/Programmer	25,123	25,543	23,472	22,800	23,147	30,666
Manager of Operating Sys. Programming	34,877	30,667	34,552	NA	NA	42,507
Senior Systems Programmer	33,947	31,203	38,500	NA	30,000	44,022
Manager of Computer Operations	24,071	24,366	24,138	NA	24,343	24,124
Shift Supervisor	20,237	20,600	19,625	NA	NA	17,180
Lead Computer Operator	17,416	17,766	17,118	11,000	18,043	16,734
Computer Operator	14,685	15,200	14,713	10,500	15,082	15,099
Control Clerk	13,867	14,467	12,880	NA	NA	12,491
Data Entry Supervisor	15,875	15,143	18,164	32,000	13,958	14,252
Data Entry Operator	13,012	12,994	13,676	12,167	11,220	11,820
Word Processing Supervisor	17,750	NA	17,583	30,000	18,800	21,000
Word Processing Operator	14,435	14,000	14,368	22,000	20,000	12,072

AVERAGE SALARY BY REGION (IN $)

TITLE	ALL	BOSTON	MANHAT	NYC PHILA	WASH/ BALTI	ATLNTA	DALLAS
Vice President	47,562	50,357	80,000	55,240	42,111	59,278	40,667
Director of DP/MIS	36,264	41,000	58,875	43,406	40,000	40,864	32,529
Services Coordination/User Liaison	27,794	36,000	34,500	35,933	24,500	37,500	NA
Manager of Systems Analysis	37,526	38,000	51,000	45,700	36,000	36,875	NA
Senior Systems Analyst	35,671	51,000	45,500	37,640	40,100	29,800	41,000
Systems Analyst	26,420	23,000	28,000	28,000	31,667	24,000	NA
Manager of Applications Programming	33,131	27,500	34,000	45,375	43,000	35,167	25,000
Lead Applications Programmer	29,756	20,000	49,667	37,750	34,500	21,056	NA
Senior Applications Programmer	26,900	26,333	38,000	33,200	38,000	21,200	NA
Applications Programmer	22,121	22,250	25,000	26,917	20,600	22,333	18,594
Junior Applications Programmer	16,907	17,333	24,000	18,487	NA	15,200	16,498
Manager of Systems Analysis/Programming	32,378	34,833	NA	43,833	47,600	30,750	25,000
Lead Systems Analyst/Programmer	33,714	35,000	75,000	36,300	42,333	28,000	55,000
Senior Systems Analyst/Programmer	30,461	30,000	44,500	34,460	31,864	27,400	35,000
Systems Analyst/Programmer	25,123	25,500	30,667	29,062	24,667	28,500	NA
Manager of Operating Sys. Programming	34,877	41,000	NA	55,000	44,000	32,000	NA
Senior Systems Programmer	33,947	NA	50,000	45,000	35,350	35,000	NA
Manager of Computer Operations	24,071	18,500	37,500	28,417	21,800	22,033	17,500
Shift Supervisor	20,237	18,000	NA	22,800	NA	18,500	NA
Lead Computer Operator	17,416	15,873	23,000	17,540	16,416	14,375	16,983
Computer Operator	14,685	13,806	17,675	14,769	16,700	13,827	9,710
Control Clerk	13,867	NA	14,300	15,420	NA	12,000	NA
Data Entry Supervisor	15,875	14,340	18,200	20,650	15,500	14,583	17,500
Data Entry Operator	13,012	11,520	14,267	13,452	12,868	12,240	12,333
Word Processing Supervisor	17,750	10,000	35,000	24,000	15,500	20,333	NA
Word Processing Operator	14,435	15,500	19,500	17,317	14,000	13,000	NA

NA: not available

OTHER SERV	DISTRB	GOVMT	MED/ LEGAL	TRANS/ UTILS	EDUC
51,125	50,428	32,180	55,500	46,250	43,250
39,408	34,990	34,796	38,376	30,996	28,860
40,000	27,833	24,000	19,700	NA	20,500
40,700	29,333	32,460	25,000	NA	37,967
39,200	31,545	32,257	26,000	24,000	36,700
29,500	25,500	19,684	NA	NA	21,750
44,000	25,896	29,725	23,800	NA	22,500
50,000	28,250	25,685	20,000	NA	NA
22,000	21,100	25,000	30,000	NA	19,333
16,500	20,175	22,335	22,000	21,737	17,000
16,000	14,167	16,320	12,000	NA	13,200
36,750	26,287	34,254	26,625	34,000	31,460
37,500	34,650	28,100	NA	39,000	27,583
25,000	27,000	25,188	23,650	37,000	31,000
26,375	18,457	27,149	21,268	27,800	27,113
NA	NA	25,000	NA	NA	NA
NA	29,650	30,500	NA	26,000	32,700
29,750	18,700	24,225	19,537	26,800	30,919
20,000	23,750	19,000	NA	24,000	NA
NA	17,220	21,822	15,933	16,664	16,320
14,567	14,115	15,872	12,902	12,875	15,686
16,000	13,393	15,252	14,500	NA	15,001
15,833	16,360	16,344	17,500	19,133	15,100
14,020	13,159	13,619	13,209	15,082	11,565
20,500	15,333	16,010	13,333	18,000	17,100
13,219	17,300	14,193	15,000	16,000	12,860

CHICAGO	MINN	CLEVE	CINCIN/ COLUMB	DETROIT	SAN FRAN	LOS ANGELES
41,667	60,000	36,250	37,833	49,667	42,429	58,000
36,873	33,473	34,020	30,854	33,333	43,750	46,500
30,000	NA	NA	19,440	18,500	31,000	19,000
32,760	41,000	36,000	33,500	17,000	47,520	38,060
32,959	34,750	35,833	31,250	54,000	42,667	44,667
NA	29,000	NA	23,250	13,400	32,333	32,000
31,567	42,000	NA	28,025	NA	34,750	32,750
20,000	40,000	22,000	30,000	NA	29,000	27,000
26,875	37,000	30,000	24,833	NA	28,000	35,000
19,798	26,700	19,500	37,500	15,500	21,750	20,685
18,667	21,000	18,000	19,000	12,000	16,880	18,083
32,180	33,150	31,000	34,267	24,250	35,333	NA
24,300	34,500	25,000	35,000	30,000	37,250	36,000
NA	26,952	32,000	30,500	39,000	30,070	NA
25,749	22,071	30,000	26,000	25,000	26,333	29,000
32,000	60,000	23,760	35,000	NA	26,000	33,000
27,150	38,000	NA	30,000	NA	39,000	NA
26,518	21,300	25,828	26,167	12,000	23,543	30,250
17,000	23,500	20,000	NA	NA	25,000	NA
16,281	15,300	15,850	18,167	16,931	21,929	NA
15,059	17,583	15,643	12,725	13,627	15,467	19,187
13,026	18,500	NA	12,000	NA	14,000	NA
14,500	15,300	16,000	11,000	16,167	16,478	19,970
13,233	13,133	12,584	12,586	13,960	14,072	15,928
16,000	18,000	NA	20,000	12,500	18,400	18,500
15,000	14,500	14,750	16,000	11,688	16,500	14,240

will lag behind those achieved by dp personnel this year. The Conference Board recently reported that a survey of its Fortune 1,000 members showed an average increase of 6.5% this year, and another 6.5% expected in 1985, increases significantly below the level estimated by dp managers for the DATAMATION survey.

Another silver lining on dp salary increases is that they are expected to exceed the inflation rates. Wharton economists estimate that compared to last year the consumer price index inflation gauge will run about 4% this year and on into 1985. As many dp managers focus on inflation as one of the prime determinants of merit increases, shops in areas with a plentiful supply of savvy analysts are not pressured to inflate the payroll.

In Minneapolis, for example, General Mills has a hard time finding CICS programmers and telecom experts, but in general is not suffering from wholesale personnel shortages. "We made the decision, in view of the low inflation rate, for across-the-board 5% to 6% salary increases," says James Bird, director of information services. "We've had the opportunity to select from a well qualified group when we've had openings."

In Los Angeles, Bill Sumner of Bullock's relies on local salary surveys to determine the level of merit increases for his staff of 110 programmers, operators, and support staff, and he suspects that the pressure of the demand in the Los Angeles area will be reflected in the upcoming surveys. He says he will boost the percentage increases to stay competitive. He anticipates that "the first financial manifestations of a tightening job market will be seen six months from now," and speculates that "if there's a material change in survey, it will hit the dollar line in early 1985." He thinks the evidence suggests that demand will boost merit increases.

BOTH COASTS AFFECTED

The tightening job market, and its impact on salaries, is also being felt on the other coast. "During the recession, not too many local companies were growing their staffs," notes Bradford Sweet, group director of MIS at Wang Laboratories, Lowell, Mass., outside of Boston. "Now, as the economy improves, and companies speed up their operations, turnover may increase. Data General and DEC will do some hiring, and the old-line companies in the area will pick up too." Wang did its wallet fattening a few years ago, but the demand for people may be pushing the typical salary increase above the level Wang is now paying.

The uneven economic recovery means dpers in many regions and industries won't need fatter wallets.

"In 1981 we thought we were not competitive with the market in terms of salaries, so 1981-82 salary increases went up 13%, in part due to inflation," Sweet says. "In 1982-83, they went up 9% to 10%, and 1983-84, up about 8.5%." That compares to a local average increase of about 9.7% for 1984, so Wang may find itself behind the eight ball again.

The boom and bust cycles of the economy are having quite an effect on Wall Street. Banks are reeling from the cost of nonperforming loans to third world countries. Major brokerage firms are showing losses. Yet, dpers are not involved in the bulk of the financial industry layoffs. "The brokers may be shrinking people, but not in dp," contends Warren Kornfeld, currently a dp recruiter for Management Recruiters International Inc. in Woodbury, N.Y., and formerly head of dp at National Shoes in New York. "Dp project plans are one to three year projects, and they are not affected by the market's volatility. I haven't been touched by the recession in three and a half years." Adds the MIS vp for a major financial services firm, "The brokerage industry feels itself short of talented systems programming people, and if there are layoffs in that area, dp managers are only using that as an excuse to drop weaker personnel."

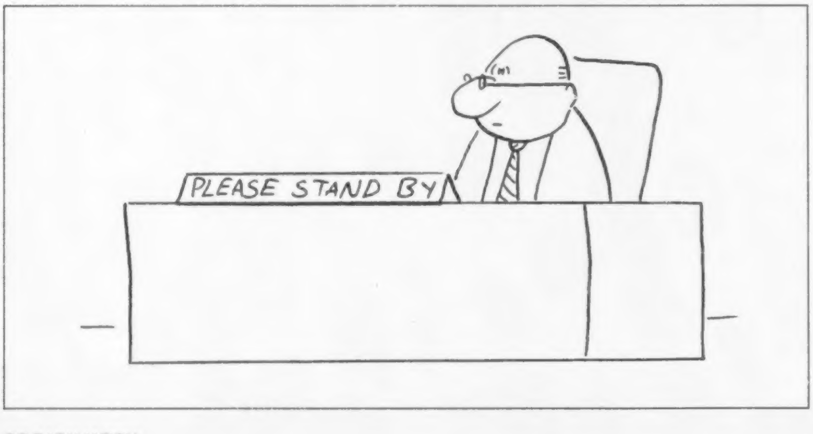
No matter what the region or industry, dp managers facing the perennial question of how to divide up the extra cash report serious attempts to give higher awards to their more productive personnel. "When salary budgets decline, or increases are smaller, dp managers become more selective about who gets what," explains Edward T. Redling, president of Executive Compensation Service Inc., the Fort Lee, N.J., subsidiary of the Wyatt Co., an actuarial and consulting firm. "When salary increases decline to the 5% or 6% level, the [budget increase] pie is not that big, and managers have to do some judicious selection of who gets what. They use the size of the salary increase to differentiate and reward outstanding performance."

Herbert Woods, vice president at Wall Street brokerage firm Paine Webber, says that in the past, "merit increases have ranged from 6% to 10% annually, and usually 8%, but this year they'll be around 6%," due to the doldrums in the stock market. He'll use the traditional end-of-year bonus, however, to reward higher performance personnel.

"Six percent sometimes causes unhappiness, but we can make it up in bonuses," Woods explains. "Last year two guys were disappointed with 6%, but later we gave them big bonuses. In brokerage, bonuses can run to 12% to 15% of salary, but in 1983, it was 11%. I've given as much as 20% based on performance. I can recall last year giving some guys 5% or 6% in bonuses and others getting 16%."

Adds Richard Kislowski, vice president for information services at Denny's Inc., Los Angeles, "We will focus on greater differential on outstanding performers in the future. Nobody will see an average—some will see less, others will see three, four, or five percentage points more than an average." Sumner of Bullocks adds, "While others lean toward a cost-of-living type of raise, we place a disproportionately large amount of raise on merit. We give the most to the best."

More judicious use of the available dollars has become the hallmark of dp management these days. Even in areas where potential employees are plentiful, dp managers are developing new strategies for bringing people in the door and keeping them there. "It's a difficult time to attract people, regardless of money, because it's a technology market out there," contends Bob Regazzi, vice president of management information systems at Schering Plough, the New Jersey-based pharmaceutical company. "People are interested in working with state-of-the-art equipment."



NOTHING LIKE CASH

Benefits such as reimbursement for education, company cars, and other perks continue to be popular, as noted last year ("1983 Dp Salaries—The Key Word Is Perks," September, p. 82). But there's nothing like cash to attract people. "We do not look at prior salary history," says Woods of Paine Webber. "If we need someone and find someone with the skills, we make the offer. We've paid 20% to 25% over current salary." Any possible inequities that might develop between the newly hired bonus baby and the veteran employees are corrected with the bonus, he quickly adds.

No matter how much money a dp manager has to offer, finding additional qualified systems programmers is an almost impossible chore these days. "It's hard to get systems development personnel," relates Regazzi of Schering Plough. "Nothing has happened so far to drive us to offer packages way out of line, but they're at a premium."

John Mariana, vice president for information at Anixter Bros., a Chicago-based electrical equipment supplier, sounds disgusted as he relates his experiences trying to fill, and keep filled, key dp slots. "We have been paying higher prices than we would like to, higher than we feel they should be. We don't feel the skill level justifies the salary."

A few years ago, says New York dp recruiter Max Sabrin, the primary demand was for people with COBOL programming experience, but now CICS, IMS, and other big mainframe systems are the key need. "I can get them three appointments, like *that,*" he says, snapping his fingers.

The shortage of systems programmers extends all the way up the chain of command to management. "We have worn ourselves out looking for programmers with three to five years of experience," says Sweet at Wang. "It is hard to find a true project manager who understands all facets of the process and has the necessary people skills. Many have a background in systems analysis, but they lack other background, such as people skills, the soft skills."

Another tight area where demand clearly exceeds supply is telecommunication expertise. "This is the era of telecom and databases," declares dp recruiter Kornfeld. "It had been in the fetal stage, now it is spurting." He says that a New York-based manager of telecommunication can command a salary of between $60,000 and $100,000 per year, significantly above

CARTOON BY REX F. MAY

"We have worn ourselves out looking for programmers with three to five years of experience."

the level found in the DATAMATION survey. Adds the vp of MIS at a financial services firm, "People who know both voice and data are scarcer than hen's teeth. Network designers, with voice and data experience, are essentially unobtainable."

Many dp managers, and indeed, most of corporate America, blame a lot of their telecommunication problems on the divestiture of AT&T's operating companies. "It made the mundane part of telecom effort worse," notes Kislowski of Denny's. "Before, people would just have to do some design work, and AT&T would take care of the details. Now they have to spend time patching and fixing problems that are the result of poor communications with Bell operating companies."

The West Coast MIS vp for a major DOD contractor elaborates. "The telecom environment is different than in the past," he says. "Now people are running their own telephone company within their company. These telecom managers are not used to the responsibilities. They don't have much of a management background because before it was not hard to run the function—just know the tariffs, the telephone company did all the work."

Sumner at Bullock's and Sweet at Wang both took the same approach to filling the need for telecommunication expertise—grow 'em yourself. "We had to train, develop people internally for the network control operations," relates Sweet. Sumner boasts he staffs up his operation with personnel from other departments in the stores. "A budding actress is our datacom manager right now," he says. "She came to us out of college, worked in computer operations, and had a real flair for hooking up crts. So we sent her to technical schools."

The growing popularity of database management systems has, naturally enough, led to demand for DBMS expertise. "There's a tremendous scarcity of database people,"says Kornfeld, "such as IMS programmers. Since Cullinet's IDMS is being used in large shops, and is a derivative of IDS from Honeywell, the users' needs are being met with IDS experience."

Dp managers with tight cost controls report that they are offsetting the personnel shortages by buying programmer productivity aids and other tools. Sumner has more than a dozen at Bullock's, he says. Kislowski of Denny's notes, "We are extremely happy with fourth generation packages, such as Focus. We do prototyping on it and use it extensively for reports, decision support, and databases."

Others warn that these tools are no panacea for long-term demands. "The productivity growth that dp managers are getting from improved technology will at best keep the growth rate constant," a vp for MIS contends. "Otherwise, I think we are stuck with exponential growth." ◉

The 1984 DATAMATION salary survey is now for sale in report form. It contains more than 160 pages of tables showing the average salaries for 45 different dp jobs in 18 major geographic areas and is broken down by 12 industry sectors. Single copies are $100. To order, send a check to Laurie Schnepf, director of research, DATAMATION, 875 Third Ave., New York, NY 10022.

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CIRCLE 16 ON READER CARD

European dp managers face obstacles that might surprise their American colleagues.

THE CHALLENGE OF USERS AND UNIONS

by Andrew Friedman, Joan Greenbaum, and Michael Jacobs

Like their American counterparts, most European dp managers are eager to fully involve users in the design process and to give them what they need, rather than what they say they want. But here the similarity ends. The history and culture of European data processing departments have given rise to a different set of attitudes and methods. Firms doing business with European dp departments should be aware of some marked differences.

In the Sept. 1 issue ("Wanted: Renaissance People," p. 134), we reported the results of an in-depth survey of U.S. dp departments. Our research also includes extensive interviews with dp managers in England, Norway, and Sweden, which, when grouped together, shall be referred to as Europe (see "Methodology," p. 94). There were some very interesting findings. For example:

- European dp managers have less control over decision-making within their departments and their firms.
- A history of working with users is more common in European firms than in American firms.
- European managers prefer to try new methods and procedures rather than alter the organizational structure.
- Contrary to the American image about formal European education, European firms put less emphasis on college degrees for programming and systems staff.
- Programmers and analysts are heavily unionized in Europe, which gives these staff members more of a say in departmental policies.
- European dp salaries are more in line with average white-collar salaries and do not tend to climb as rapidly as American wages.

Large firms in Europe are highly unionized, and this applies to white collar as well as blue collar staff. Dp personnel, including professionals like programmers and analysts, are likely to be union members. While data on union membership rates are hard to come by, about 53% of all programmers and analysts in the firms we surveyed were trade union members. Only 13% of data processing staff in the American sample are union members, and virtually all of these are in the public sector. European unionization rates are lowest in service bureaus and manufacturing firms, where only about a quarter of the professional staff belong to a union. While this is low by European standards, it is in stark contrast to the absence of any union membership in this area in the U.S. (see Fig. 1).

The strong presence of unions clearly alters the options that management has in making organizational changes. European trade unions often resist quick departmental reorganizations as they may result in a deterioration of working conditions or status for some of their members. In a fairly common move, a Swedish firm recently set up a service bureau as a separate company to avoid union restrictions.

UNIONS NEGOTIATE FOR ALL

In most large European firms, salary levels, as well as certain hiring and firing procedures and even promotional opportunities are negotiated by unions for all white collar staff, including dp professionals. It is often difficult, therefore, for dp managers to act on raising salaries or promoting staff without upsetting the negotiated salary structure for the entire firm. At least 50% of those interviewed said their salary and promotion policies had to be approved outside the department. In a parallel survey, American managers had more of a free hand in this matter; only 25% reported that their staffing decisions had to be formally approved elsewhere.

One European manager even said that "data processing staff are sometimes in a worse position compared to other staff because dp is a small fraction of the union so wages are sometimes lower." Programmers and analysts in larger firms rarely see the special salary hops to which American dp staff have become accustomed.

Compared to their American counterparts, entry-level programmers and analysts in Europe are much less likely to have a college or university degree. Seventy-three percent of European managers hire programmers without a college degree, while only 30% of American managers in our survey would consider this option (though the educational systems are not, of course, precisely comparable). In general, a college degree, whether in computer science or any other field, is not necessarily expected. Since most large European firms train their own programmers, they are less interested in hiring staff with college credentials. At the programmer/analyst level, 65% of European managers accepted candidates without degrees, compared to 16% of American managers (see Fig. 2).

For almost 30 years, the market for experienced systems and programming staff has been very tight in Europe. The fact that most large firms train their own programmers makes the problem of labor turnover all the more serious. As in the United States, young programmers and analysts commonly start out in major firms. After two to four years, they move on to higher paying jobs in service bureaus. Firms in the computer service sector are those least likely to be unionized and most able to offer attractive salaries and promotional opportunities.

There is tremendous concern in Europe about service bureaus luring junior dp staff away from large firms just when these people are beginning to yield a return on their training costs. Data processing managers in user firms complain continually about this form of personnel raiding. The British call it poaching, and a 1980 study by the Central Computing Telecommunications Agency of the British government suggested limiting training of new staff and restricting less experienced staff to maintenance work to help minimize the damage caused by poaching.

An expanding European economy may bring back the demand for trained programmers and analysts.

In recent years, poaching has become less of a problem, mostly because the recession has reduced the demand for programmers. This respite could be short-lived, however, as an expanding European economy may bring back the demand for trained programmers and analysts.

Recently, European governments have been pushing educational institutions to provide more practical education in a range of computer-related subjects. The British government has made information technology a high priority for new appointments in all universities. It has also developed a wide range of short-term training programs through the Manpower Services Commission.

The Swedish and Norwegian governments have initiated a number of university departments to teach the new subject of "informatics." Informatics deals with the handling of information, communications, and systems analysis, rather than the mathematical focus of the traditional computer science degree. While the equivalent of informatics does not yet exist in the U.S., it can be conceived of as a liberal arts program featuring both humanities and technical subjects. As we pointed out in our earlier article on the American scene, dp managers here are eager to hire generalists to work with users. Indeed, the informatics degree might very well fit the bill in the U.S.

The tide of user involvement in dp functions has risen rapidly on both sides of the Atlantic. User-driven systems are becoming more common, as is computer literacy among end users. Both trends lead to more sophisticated users who demand more from dp departments and who have less patience with long delays in systems development or operational bottlenecks.

GETTING THE USERS INVOLVED

The European approach has been to fully emphasize user involvement in the system design process. In Sweden this has gone as far as pushing methodologies, like system sketches, that let users handle the design phase. The Norwegians have taken another tack. They choose to foster user involvement by encouraging computer literacy for users, and, in fact, have brought this about through a legal process known as the New Technology Agreements. These agreements, negotiated with most large Scandinavian firms, create a new category of union representative called the data shop steward, who is given time off to increase his or her technical skills and help other end users do the same (see "New Technology Agreements," p. 98)

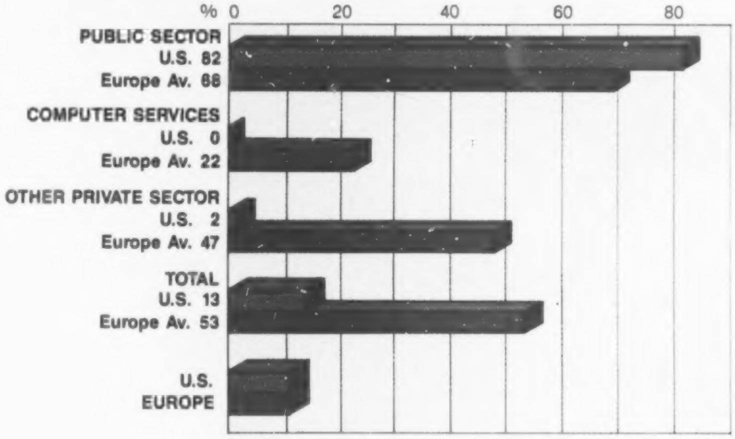
SURVEY METHODOLOGY

This international study of data processing management was funded primarily by the British Economic and Social Research Council. The findings here emerge from a sample of 199 dp managers in Great Britain, Norway, and Sweden. The results of interviews in the U.S. have been previously reported (see "Wanted: Renaissance People," Sept. 1, p. 134). Interviews are still going on in Japan.

In each country, senior level dp executives were interviewed using a standard questionnaire. The interviews, often lasting more than three hours, were conducted by nationals of each country. The research is part of a four-year study (begun in mid-1981) and is considered the only in-depth survey of dp management techniques of its kind. The researchers from the different countries have formed the International Computer Occupations Network to continue project work.

FIG. 1

TRADE UNION PARTICIPATION RATES*



*Based on sample firms included in survey
Europe equals Norway, Sweden, and England

From an American perspective, perhaps the most interesting thing about Scandinavian user interaction is the fact that this involvement includes all workers in a user department. American experience with users focuses on discussions with user management and perhaps a few members of the user department. For the Scandinavians, the term end user includes all workers who are likely to be affected by the coming system. By this definition, data entry clerks as well as secretaries need exposure to some aspects of the system design.

As American dp managers are sensitizing their staff to user needs, Scandinavians are emphasizing user education. If the American angle has been to make the dp department know more about users, the Scandinavian model has been to make users understand dp!

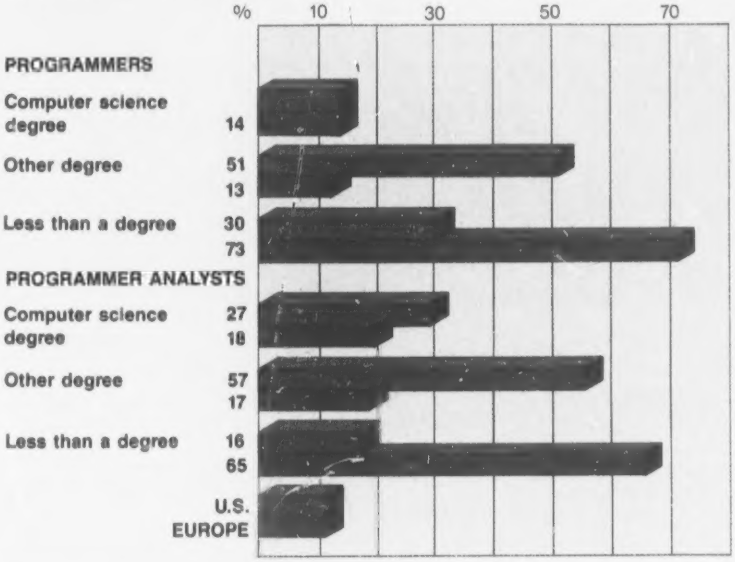
It is increasingly common in the Scandinavian countries for users to do their own feasibility studies. A Swedish manager explains their movement toward user power this way: "We use a special concept here called the system *owner*. This means that the users have the authority to start a project and that they are responsible for all aspects of it including reporting to senior management."

Data from our survey showed that 64% of European users are always involved in project development steering committees. The comparable figure for American firms is 45%. In Sweden and Norway, almost three quarters of all dp managers report that users are always included in such planning committees (see Fig. 3). Forty-two percent of the Europeans surveyed said that their users sometimes provide systems analysis support—quite a high number when compared to American firms where only 28% report user involvement at this level.

Since users are clearly involved in planning and carrying out development

FIG. 2

EXPECTED EDUCATIONAL BACKGROUND



projects, European dp managers are moving away from a preoccupation with programmer productivity. Instead, building on a history of user integration, they are emphasizing methods for productive user behavior.

The heightened awareness of user needs in Scandinavia has been stimulated by end-user demands, often through the trade unions, for greater influence over system design. Most traditional design methodologies either bring the user in too late or require users to have too high a degree of computer literacy. Several approaches for solving this problem have emerged.

The Swedes, for example, have been focusing on the notion of prototyping, which includes building a sample system with dummy data. Prototyping allows users to get what we might call a quick and dirty working model up and running at an early stage in the project development cycle. The prototype, or facsimile of the future system, lets the users experiment with data entry procedures and visualize the screens and reports.

Many dp managers are trying out new methods such as Experimental System Development (an experimental prototyping system users can manipulate well before the actual system is near completion) and system sketches to aid them in their prototyping efforts. Just over one third of Swedish dp managers said they now use such methods or plan to try them in the near future. The dp department does system sketches, often accomplished with APL, to show the user "what it will be like" as the system is being developed. Database languages and new higher-level languages also facilitate the building of these prototype systems.

DESIGN IS THE EMPHASIS

While prototyping clearly helps users have a say in the early stages of system design, it is also useful for dp managers, because it enables them to lower costs caused by frequent requests by users for changes. The hope is that users who have a prototype system to play with will be less likely to demand design changes later on when the project is well into the expensive development phase. But system sketches are not without their own headaches. One dp manager complains, "With APL's help we could present a system sketch in half a day. This makes the user who ordered the system protest against the final development taking eight months and costing a lot of money!"

Another reason for the emphasis on design methodology is the fact that off-the-shelf application packages are much less common in Europe. With their greater need to design complete systems it is understandable that Europeans focus on methods that incorporate users in the design process.

Prior to the upsurge in prototyping, Swedish firms were using a system development monitoring model called SIS-RAS (Swedish Standards Institute Standardized Computerized Methodology). Developed by the Swedish Standards Bureau and made available in 1973, it is still being used by 46% of the managers in our Swedish sample. This method stipulated 10 developmental project milestones, although in practice managers rarely used more than five checkpoints. Several firms have abandoned the model, for as one dp manager explains, "SIS-RAS takes too long and it does not allow time to keep up with changed circumstances. Users should be involved from the beginning."

The recent boom in prototyping is still too new to say what its impact will be. In the end, however, the value of data processing will have to be measured by contribution to the productivity of user departments and not simply by its ability to deliver systems quickly and cheaply.

The overwhelming majority of surveyed firms are mainframe users where COBOL is still the dominant language. As with the American sample, 70% report separating applications and systems development into different functional units. Work within these units is organized according to project teams, where it is common for team members to be involved in more than one project at a time. Programming pools, the precursor to team structures, appear to have fallen into disrepute, particularly in Scandinavia where 85% of the work is accomplished in teams. These results follow fairly closely those found in the American sample where 72% of development work is organized using a team approach.

Program specification and coding standards appear to be as relaxed in Europe as they are in the United States. When departmental specification standards are required—and in Norway and Sweden this was less than 50% of the time—the only items that managers generally require are program descriptions, I/O formats, and file layouts. Decision tables, flowcharts, and test data requirements are requested by less than one third of the managers.

European managers, like American dp managers in the survey, are not terribly interested in demanding that their programmers avoid GO TO instructions. Less than 50% of the managers in the sample say they enforce this standard. The only standard that the majority of managers on both sides of the Atlantic seem to agree on is the need to include commentary within code. Ninety percent of the managers in the United Kingdom, 75% in Scandinavia, and 69% in the U.S. feel this standard should be enforced.

INFORMAL SIGN-OFF PROCEDURE

Formal sign-off procedures at specific project milestones are also not well enforced. As with the American sample, formal sign-offs are used most when a project is turned over to the operations department. Checking feasibility with users is required by 90% of Swedish and Norwegian managers and, as we would expect, this carries more weight than formal clearance with higher-level

European dp managers are moving away from a preoccupation with programmer productivity.

NEW TECHNOLOGY AGREEMENTS

A major difference between the American and European labor relations scenes is the substantially higher level of trade union membership in Europe's private sector, especially among white-collar employees. In addition to high union membership, most European countries have powerful coordinating organizations that represent trade unionists at a national level. The Trades Union Congress in Britain, the Norwegian Federation of Trade Unions, the Swedish Trade Union Confederation, and the Swedish White-Collar Unions Federation, for example, are all important actors on their own national stages. They negotiate general agreements with employer's associations in each country and have a more important and direct influence on government policy than American unions because of intimate links with Labour or Social Democratic parties in each nation.

During the past 10 years, the introduction of new computer-based technology has been the subject of many resolutions and documents emanating from both local unions and national confederations of unions in several European countries. These materials go beyond general resolutions, calling on employers and governments to protect existing employment. They also express the trade unions' desire to be involved in the process of introducing new technology.

This activity began in 1974 when a general agreement on computer-based systems was signed between the Norwegian Federation of Trade Unions and the Norwegian Confederation of Employers. The agreement states that employees have a right to receive all relevant information concerning new systems, in an understandable form, and sufficiently early to allow employees and unions to participate in system development. The agreement also provides for the employees to elect a special shop steward—the data shop steward—who takes an active part in system development.

Shop stewards play an important role in the labor relations processes of several European countries. Their importance varies greatly between companies, but they are usually ordinary employees elected directly by trade unionists who work at the same plant or section of a plant. Once elected, most carry out union related work in their spare time or during company time. Their role can be as limited as collecting union dues or as substantial as carrying out wage negotiations where national or companywide agreements are ineffective (for example, when wider agreements may only specify minimum pay rates). The data shop steward provided for in the Norwegian agreement was to have the right to receive "proper" training, during company time, to allow participation in system development. This was the first national New Technology Agreement in Europe.

Since then, New Technology Agreements have proliferated at local and national levels in many Western European countries. In England, over 100 New Technology Agreements were signed with individual companies between 1979 and 1982. The essential elements of all these agreements are that: 1) employee representives should participate in the project development of computer-based systems, and 2) these projects be evaluated not only from technical and economic points of view, but also from a social viewpoint—that is, considering changes in organization structures, human relations, employment, health, and safety. All the agreements stress the importance of access to information concerning new systems at an early date.

On paper, these agreements appear to severely limit management's flexibility for introducing new systems, but in practice the agreements have had much less effect. The main problem from the employee's standpoint is that it is difficult for those who are not computer specialists to digest the relevant information, even if access to it is given at an early stage in project development. An even greater problem is to develop a response to proposed projects other than opposition. The unions, particularly in Scandinavia, have been anxious not to appear opposed to new technology in general.

One way to overcome this problem is to give data shop stewards substantial education in system design. The result of such training has often been that they become more sympathetic to the original projects. Some have even vacated their positions to become systems analysts. This has left many unions with a desire to develop their own educational materials. In particular, a number of Scandinavian projects during the past seven years have tried to develop new models of system design that allow employee representatives to propose more "socially acceptable" alternatives than the proposed computer-based systems, rather than opposing those systems outright.

In Sweden, the Social Democratic Party, which has strong links with the Trade Union Confederation and the White-Col-lar Unions Federation, has been in power with only minor interruptions for the past 52 years. There, worker participation in top level decision-making was specified in a series of laws passed between 1973 and 1977. These culminated in the Law on Codetermination in 1977. Out of this law, the Center for Working Life Studies was set up to provide education materials for employees participating in decision-making processes, including the system design process for new computer-based systems.

So far, it is difficult to assess the impact of New Technology Agreements on the computer-based systems that have actually been introduced. But it seems likely that the involvement of end users in more than a perfunctory role has both reduced implementation problems and encouraged end-user cooperation long after the initial system implementation.

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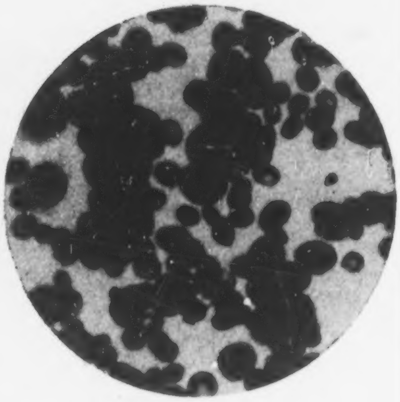
managers within the dp department.

To American managers, the presence in Europe of strong trade unions and less managerial control over staffing decisions may seem like a glaring problem. Indeed, the European history of stronger end-user involvement and relative inflexibility in altering organizational structure are departures from American dp practice. As our earlier article pointed out, when problems arise in American firms, upper management often charges in and reorganizes the department or plays musical chairs with department heads. This is less likely to happen in Europe, for a variety of reasons. The Scandinavians, for example, are particularly interested in experimenting with system design models and less enthusiastic about shuffling the organizational chart. Their problems have pushed European managers to respond to challenges with progressive solutions.

With less need to negotiate over working arrangements, American managers tend to respond to the user challenge by shuffling the organization chart to include user representatives. The relative independence of American data processing departments allows them the luxury of time to better educate their professional staff to prepare for some form of user involvement.

European dp managers, on the other hand, have traditionally confronted union organized workers within their own shops and strong users outside their departments. These users, from clerical to profes-



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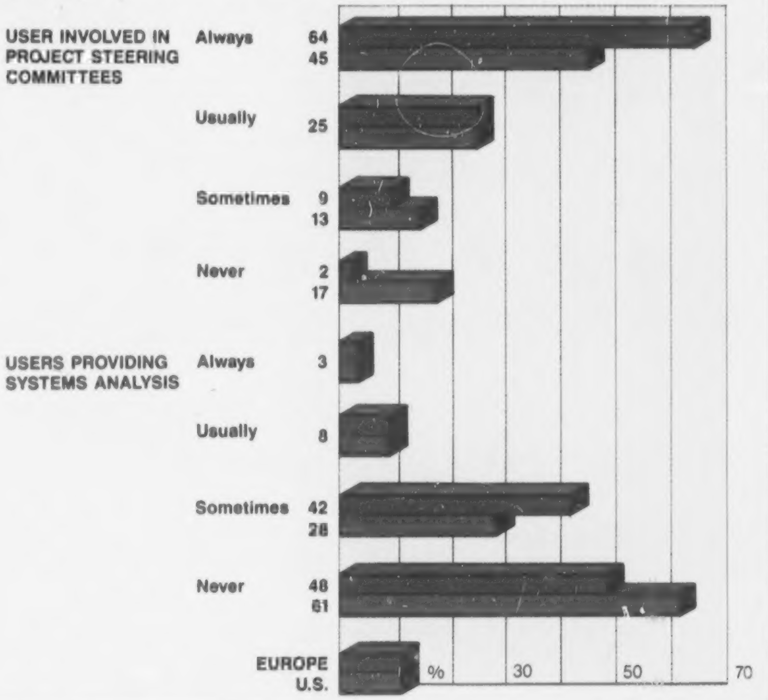
The recent boom in prototyping is still too new to say what its impact will be.

FIG. 3

USERS INVOLVEMENT IN PROJECT DEVELOPMENT



sional staff, increasingly have the backing of New Technology Agreements to help them demand participation in system development. This tradition is encouraging dp managers to focus on methods that place less emphasis on programmer productivity and more weight on the productivity of user systems.

Within the European framework, end-user clout is less significant than most trade unionists would like it to be, but is nevertheless an effective force in moving managers to try methods that integrate these workers into the system design process. Since American dp departments have more of a culture of separatism, the challenge of user integration is indeed a major one. European managers face the problem no less squarely, but have a history of user involvement on their side.

During the 1960s and '70s the independence of American data processing departments was an advantage for American companies. It allowed them to be more competitive with salaries and promotions to attract and keep specialist talent. Now American managers are facing a trade-off between their distinct status and the separate, but increasingly equal, power of sophisticated users. As the survey points out, European company culture offers some attractive alternatives. ◉

Andrew Friedman teaches economics at the University of Bristol, England. He is the principal investigator of the study reported on in this article and author of *Industry and Labour* (available in the U.S. through Humanities Press, Atlantic Highlands, N.J., 1977) as well as several articles on work organization in computing.

Joan Greenbaum is an assistant professor of data processing at LaGuardia Community College in New York. She is author of *In the Name of Efficiency* (Temple University Press, Philadelphia, 1979), and frequently lectures on technology and social change.

Michael Jacobs, who has worked with the Labor Institute in New York, is a student with the Graduate Faculty, New School for Social Research, New York.

We would especially like to thank Carol Bates and Dominic Cornford, our project staff in Bristol, for their contributions.

PHOTOGRAPH BY JAMES JOERN

So far, the information-at-your-fingertips promises of videotex have all been written in red ink.

VIDEOTEX: INTO THE CRUEL WORLD

by Efrem Sigel

"The waiting is over." That's the message on the cover of the promotional kit for Viewtron, Viewdata Corp. of America's Miami-based consumer videotex service. But for Knight-Ridder Newspapers, parent of VCA, the waiting is far from over; in fact, it has just begun. Viewtron was launched in south Florida last Oct. 31, after more than three years of experiments, putting Knight-Ridder in the hole to the tune of $17 million, with an additional $17 million investment slated for 1984. Cash continues to drain away, not only for Knight-Ridder, but for other companies in the business: AT&T, Times Mirror, Honeywell, Digital Equipment Corp., IBM—as well as many European and Japanese suppliers. A worldwide investment in videotex approaching a billion dollars is not an implausible estimate; it's hard to find two companies in the field that have earned a dollar.

The problems with consumer videotex services can be summarized in two propositions, each closely related to the other. First, almost none of the intended customers knows what videotex is and what it can do. Second, those people who are the most likely users of a computerized information service already own or are in the market for personal computers. It is extremely unlikely that they will go out and acquire a second piece of hardware in order to access videotex. As of this writing, no personal computer can access a videotex service, and no dedicated videotex terminal can perform any of the functions a pc can.

Nowhere are the promise and the ordeal of videotex better illustrated than in Viewtron. Viewtron delivers news, sports, classifieds, games and quizzes, financial information, and electronic messages, all in a frame-by-frame format featuring easy-to-use menus, high-resolution graphics, and up to 16 colors at a time. The Viewtron database stores well over 100,000 frames of information, but permits access to many millions through its gateway facility.

Gateway refers to a computer-to-computer connection that enables a subscriber who is on-line to the Viewtron computer in Miami Beach to be switched into one of seven other computer systems, operated by American Express, J.C. Penney, E.F. Hutton, Grolier, Commodity News Services, Official Airline Guide, and VideoFinancial Services (see Fig. 1). This last supplier is an electronic banking intermediary, formed by six major banks to provide services in various regions around the country. Although home banking is often mentioned as one of the prime advantages offered a videotex customer, it is off to a slow start in south Florida: as of early May, only Southeast Bank was actually offering the service, and the subscribers numbered about 200. (Elsewhere, where a pc rather than a videotex terminal is required for electronic banking, services are meeting a better response. See below.)

Viewtron's experience shows how complex it is to organize and deliver videotex. Knight-Ridder is the system operator in south Florida, responsible for creating the information, storing it in Tandem NonStop computers, and signing up, serving, and billing customers. However, the functioning of Viewtron also depends on:

- communications lines furnished by Southern Bell in its local area data transport (LADT) network;
- Sceptre videotex terminals manufactured by AT&T;
- information supplied by outside publishers, including *Consumer Reports*, the *New York Times*, Dow Jones, *Congressional Quarterly*, and the American Library Association;
- advertising from both local and national companies. These range from Dadeland Mall, Alpha Rent-A-Car, and Prager Travel to Merrill Lynch and Pan Am. Advertisers pay $1 per frame per week for storage, although a new package plan will give them about 50 frames for a year—including frame design and creation—for $5,000. (By comparison, when Times Mirror's service starts, its package of several hundred frames will cost advertisers $25,000; it

Getting these systems to mesh smoothly is "like performing a high-wire trapeze act."

wants to present this as market research rather than a media buy.)

TYPICAL MONTHLY CHARGES

In order to use Viewtron in its original form, the customer had to acquire an AT&T Sceptre Videotex terminal (regularly priced at $900, but offered in south Florida for $600), pay a monthly subscription fee to Viewtron of $12, and pay $1 per hour to Southern Bell for phone service. Viewdata figured the typical monthly tab at $26.

The marketing of Viewtron involved getting the customer to purchase the terminal at one of 19 AT&T Phone Center stores in south Florida, or any of 24 other participating retailers, including Burdine's department stores and ComputerLand outlets. Despite heavy media advertising and personal selling to well-heeled individuals like preferred bank and brokerage customers, sales in the first six months were slow. At its April annual meeting, Knight-Ridder announced it had signed up 1,500 subscribers, 80% in south Florida and the rest scattered throughout the country. That number represented less than a third of its announced goal of 5,000 by the end of the first year. Since the $600 price tag on the terminal was an obvious obstacle to getting subscribers, Viewdata shifted gears in April, announcing a package plan that would lease subscribers a terminal, provide 12 hours of phone service, and unlimited access to the database for $39.95 a month—with a three-month minimum.

(Times Mirror's price will be $19.95 for service, $29.95 including a terminal; it will get off the ground in late summer in Orange County, Calif., where most phone customers have unlimited local service for a fixed monthly fee.

Another videotex provider, Keycom Electronics Publishing, Schaumburg, Ill., will offer variable pricing when it starts in Chicago this fall. After a sign-up charge of $25, customers will pay $9.95 a month for the first five hours of database access, and an additional $15 for the next 10 hours. Keycom is a joint venture of Centel (the majority owner), Rupert Murdoch's News America, and Honeywell. A Honeywell subsidiary will make the videotex terminals, to be available through Chicago area retailers at about $750 each.)

The problem of selling videotex, however, goes well beyond the pricing of the terminal and the monthly service. When Norm Morrison, executive vice president of Viewdata, was asked what will induce consumers to sign up, he answered, "We never believed there would be, and there is not a single compelling reason to buy." Among the services that can be attractive to potential customers are home banking, stock quotes, airline schedules, and news. Indeed, news—updated around the clock and available at the touch of a button—is turning out to have strong appeal.

FIG. 1

VIEWTRON'S GATEWAY SERVICES, SOUTH FLORIDA

SUPPLIER	NATURE OF SERVICE	CHARGE
American Express	Travel, vacation planning, other	Free
E.F. Hutton	Review of customers' portfolios, market position, cash, and margin balances	$17 per month
J.C. Penney	Sales of merchandise from catalog, with order confirmation, credit authorization	Free
Grolier Inc.	Academic American Encyclopedia full text: 9 million words in 28,000 articles	Free
Commodity News Services	Stock and commodity price quotes, other information on major markets	Free
Official Airline Guide	Airline flight schedules, fares between hundreds of cities	$3 per hour
VideoFinancial Services	Home banking through Southeast Bank, 10 other banks	Banks set fees; Southeast charges $3 per month minimum

SOURCE: COMPILED BY COMMUNICATIONS TRENDS INC., FROM VIEWTRON

Ask other videotex proponents what will make consumers embrace the service and you get similar answers. James Holly, executive vp of Times Mirror Videotex Services, argues that "the hook to get new subscribers on day one is home banking plus a really good news service." The importance of news, he says, is simply that "some people are very attracted by the idea of having the news before anyone else."

At IBM, William Seelinger, manager of videotex market development (and chairman of the U.S. Videotex Industry Association), also attaches considerable importance to financial services. As new financial giants reach for ways to attract customers "they'll be looking fervently for ways to outdo the other guy." One way can be to have a videotex application that involves packaging hardware and service.

WHAT HOME BANKING CAN'T DO

Of course home banking by computer has its limitations. While customers can authorize payments, transfer funds between accounts, and check their balances, they cannot make deposits or get cash as they could with an automated teller machine (ATM). Furthermore, Viewtron banking is not real time. The transactions are transferred at the end of each day to the VideoFinancial Services computer, from whence tapes will be cut for each participating bank. Getting these different computer systems to mesh smoothly is, in the words of Morrison, "like performing a high-wire trapeze act" between the twin towers of the World Trade Center. Banks could speed the process by investment in new systems and equipment, and by aggressive marketing of the new service—but that would mean significant outlays that most are reluctant to make until they see a glimmer of consumer demand. "Come see us when you have 10,000 subscribers" is what some banks have told the Viewtron people.

Whether the hook is home banking, or the ability to order merchandise from Penney's, or being first with late-breaking news (Viewtron subscribers knew that Andropov was dead even before Reagan was awakened with the news—one of the service's early news beats), it helps to have a clear idea of why customers are buying videotex and what they'll get from it. Perhaps it's unfair to expect videotex companies to define their customers very precisely today, but they have to try. Morrison says the Viewtron customers are "upscale, achievers, family people, professionals, hard drivers, self-starters," which doesn't quite explain what they want it for. He also in-

Videotex might have had a chance back in 1977, 1978, even 1979, before the pc makers got rolling.

sists that they are not computer buffs.

To test these perceptions, I phoned three out of the four subscribers whose names were given to me by Viewtron. Two of them were young boys, nine and 11 years old, whose fathers had bought Viewtron for them as gifts; both families owned home computers. The nine-year-old said he used the service every three days or so to play games like Trivia Quizzes. He pronounced the service "better" than his Atari 600XL because "you can do more things with Viewtron," like checking stocks or making purchases (though it's unlikely he does much of either). The 11-year-old said he spent two hours with the service every day, doing homework assignments from the Academic American Encyclopedia (yes, a printer—not yet available—would be a big help, he agreed), scanning sports results, and looking at news headlines. He, too, prefers the service to his computer, a Coleco Adam.

The third purchaser, Alexander Graham of Fort Lauderdale, Fla., confessed that he was "not a very good candidate" to give his opinion, having dropped the service. The idea for Graham was that Viewtron would be an educational experience for his 10-year-old daughter, but after 10 days "she had done all she could," so they took the Sceptre terminal back and got a refund. Graham said Viewtron had a number of appealing things, "but in terms of what we bought it for—to assist her in her education—it was not what we wanted." The Grahams are now considering purchasing a home computer.

These three cases are far from a systematic sample, but they do point up some lessons that those who design consumer information services often forget. Consumers never buy videotex or a VCR or a compact digital audio player in isolation, but as a choice from among hundreds of alternatives. Despite the Viewdata slogan, no consumers have been hanging around the house "waiting" for videotex to arrive on the scene. Rather, they have been indulging their desire for the latest electronic gadgets, or doing what they feel they must for their kids' education, by buying VCRs, home computers, encyclopedias, or by sending their children off to computer camp.

To establish itself as a viable service, let alone a force for sweeping social change, videotex must provide specific benefits at an attractive price. Buying a $300 home computer or a $900 encyclopedia is a one-time expense; in contrast, there are probably few parents willing to spend $40 a month indefinitely on a Viewtron subscription just because it is edifying for the youngsters. Also, because the range of services available on videotex is so broad, the temptation is to avoid zeroing in on a few, easily communicated benefits and instead to sell the service as the passkey to a new world of information at your fingertips.

FIG. 2

PERSONAL COMPUTERS AND VIDEOTEX, THE MARKETING COMPARISON, 1984

	VIDEOTEX	PERSONAL COMPUTERS
Principal suppliers	3	50
Retail outlets	40	10,000
Advertising/promotion	$5 million	$750 million

SOURCE: COMMUNICATIONS TRENDS INC.

FIG. 3

ELECTRONIC HOME BANKING SERVICES, 1984

	NUMBER OF SUBSCRIBERS	
SERVICE	JUNE 1984	DECEMBER 1984
Viewtron/VideoFinancial	250E	1,500E
Chemical Bank: Pronto	6,000	20,000P
Bank of America: HomeBanking	10,000	25,000P
All others	3,750E	13,500E
Totals	20,000E	60,000E

SOURCE: COMMUNICATIONS TRENDS INC., FROM COMPANIES
P = PROJECTED BY COMPANIES.
E = CTI ESTIMATES.

SERVICE IS NOT UNIVERSAL

Someone who knows all too well the dangers of the "information-at-your-fingertips" approach is Richard Hooper of British Telecom, who has been running the Prestel service—the world's first commercial videotex offering—for four years. According to Hooper, the Prestel developers made a number of near-disastrous blunders, of which the biggest was the erroneous assumption that they had a service with universal appeal, one that would bring "a world of information" to consumers in their homes. Prestel abandoned that delusion long ago to concentrate on a few highly targeted groups—mostly business—that could use specific information in the Prestel database to their immediate benefit. Hence, Prestel has become the means whereby travel agents learn the latest tour prices and availabilities; stockbrokers scan securities prices; farmers look up prices for crops.

After five years, Prestel now has about 45,000 subscribers, a far cry from the more than 1 million that its backers envisaged. The service has cost untold millions of pounds to develop and sell, although revenues and costs have been brought into a closer balance by simplifying the original, unwieldy network of computers, trimming the staff, and orienting the marketing to well-defined groups of customers. Along the way, some of Britain's most prestigious publishers—the *Times, The Economist, The Financial Times*—have withdrawn as information providers, unable to find a market for the uninspired repackaging of printed information in electronic form. They've been replaced, says Hooper, by smaller, entrepreneurial companies that understand the peculiarities of the demand for computerized information.

Hooper says the key to marketing videotex is to understand the difference between a trigger service and an incremental service. A trigger service is an application so vital to a given group of customers that they'll pay the cost, even if what they're getting is access to only 10 or 20 frames a day. An incremental service is one customers will use once they've acquired videotex, but will never cause them to buy it in the first place. Thus, travel agents would never acquire Prestel to look up weather reports, but having bought it for tour prices, they might occasionally use it to get the weather.

The approach in France is still to build a mass consumer market for videotex, but with a unique twist: to offer telephone directory assistance as the principal benefit, by making available an on-line directory to consumers; and to subsidize the development of the industry by providing millions of small black-and-white terminals free to telephone customers. By the end of 1984, the French telecommunications authority will have handed out a million of these Minitels, with plans for 3 million by the end of 1986. Imposing costs of this magnitude—billions of dollars—on phone users is possible, if not entirely justifiable, when the telephone system is a national monopoly. In the U.S. it is out of the question. What is critical here is lining up support from the pc manufacturers, not support from the phone companies.

FIG. 4

THREE VIDEOTEX APPROACHES

	KNIGHT-RIDDER	TIMES MIRROR	TRINTREX
System launch	October 1983	Fall 1984	1986
Type of owner	Newspaper company	Newspaper, diversified communications company; Canadian systems company*	Computer company, broadcaster, retailer/financial services company
Terminal	AT&T Sceptre	AT&T Sceptre	Microcomputer
Most important service	News, home banking	News, home banking	Home shopping
Subscription price	$39.95/month	$29.95/month	Low
Advertiser support	40%-70%	60%-70%	80% plus
Cumulative investment**	$34 million	$15 million	$130 million

*TM PARTNER IS INFOMART CORP., TORONTO
**THROUGH FIRST YEAR OF SERVICE
SOURCE: COMMUNICATIONS TRENDS INC., FROM COMPANIES AND OTHER SOURCES. FIGURE FOR TRINTREX INVESTMENT IS CTI ESTIMATE.

SCEPTRE NOT A BARGAIN

At present, even AT&T knows that its Sceptre videotex terminal is not much of a bargain compared to a personal computer like the Apple IIc or even the much-maligned PCjr. Thomas E. Farmer, AT&T's director of consumer information products, acknowledges that Sceptre is an "immature" product but says improvements are on the way. Sceptre, which is cordless and lightweight, has no computing capacity, cannot run packaged software, has a small and hard-to-use keyboard—and faces an insurmountable marketing battle in any head-to-head comparison with the personal computer. Personal computer and software companies will spend about $750 million this year to advertise and promote their products to customers, while Knight-Ridder, Times Mirror, AT&T, and a few other brave souls might, between them, spend $5 million (see Fig. 2). In this sort of contest, you don't have to wait for the final bell to know the outcome.

As hardware, in fact, the dedicated videotex terminal bears the same relationship to the personal computer that the ill-fated consumer video disc bore to the video cassette recorder—a less versatile newcomer that inevitably must flunk the test of consumer acceptance.

The standalone videotex terminal might have had a chance back in 1977, 1978, even 1979, before the personal computer makers got rolling. Today, however, there is no chance for a videotex service that is not linked to the microcomputer business. Dow Jones and CompuServe, operating the two largest database services, have learned this lesson well: both hitched their fortunes to the microcomputer more than two years ago, and each has passed the 100,000 mark in subscribers. Dow Jones, which closed 1983 with 120,000 subscribers, figures on doubling the number in 1984.

Home banking is only one of numerous services that are taking off among personal computer owners. In contrast to the several hundred banking users on Viewtron, as of June Chemical Bank had more than 6,000 customers for its Pronto service in New York at $12 per month, while Bank of America had just over 10,000 in California at $8 (see Fig. 3). Both services can be accessed through a variety of personal computers. Both organizations see little advantage in videotex color and graphics for customers who want to log-on, make their payments, and log-off. At Chemical, senior vice president Robert Willumstad says, "We don't think the North American Presentation Level Protocol Syntax [NAPLPS] standard offers any significant advantage" over an ASCII display. At Bank of America, vice president Stephen Yotter agrees: "From a home banking standpoint, it's probably not important" to have videotex color and graphics. Neither Chemical Bank nor Bank of America says openly what must also be prominent in their thinking: if it's banking that people want, let them get it directly from the bank rather than through the intermediary of a videotex system operator.

Some proponents of videotex still look down their noses at what Dow Jones and CompuServe are doing because these services use the ASCII format for data transmission, are limited to black-and-white displays, and are not designed to be used with the home tv set. Such limitations, it's argued, rule out a broad consumer market and exclude any possibility of attracting advertisers to defray part of the cost.

The NAPLPS videotex format developed by AT&T and embodied in the Knight-Ridder and Times Mirror services, is an article of faith for videotex backers. Seelinger observes that the ASCII display format is only one cause for the limited use of terminals; hard-to-use retrieval protocols and uncomfortable keyboards must also share the blame. The videotex display and retrieval scheme, he notes, have the advantage in "usability, appeal, convenience." And videotex is tied to the home tv, which people like, not to the computer terminal, which many people fear.

Nevertheless, companies selling videotex recognize that unless they find a way to market to existing microcomputer users, they've locked themselves out of the most obvious market. After all, with an annual sales rate of 5 million units, manufacturers of home and desktop computers sell 20 times as many units every week (100,000) as Viewtron hopes to install in one year.

PCS WITH VIDEOTEX DISPLAYS

Software that enables home and desktop computers to display information in a videotex format is beginning to appear: Avcor, a Toronto company, has announced a $100 cartridge that turns the Commodore 64 into a videotex terminal; Wolfdata, in Cambridge, Mass., has a similar package for the IBM PC; and IBM has announced its own product, PC Videotex, for shipment in October. PC Videotex will cost $250 in its PC or XT versions, $220 for PCjr. To use it, the customer needs a color graphics card, color

After all, the telephone and automobile took decades to penetrate 50% of American households.

monitor or tv set, and 1200-baud modem; the price of the color graphics card and modem will usually add another $500 to $700 to the cost. Because of this added expense—which makes the videotex software more expensive than the Sceptre terminal—James Holly at Times Mirror declares that the new software "is not the whole answer, but it helps." He says Times Mirror Videotex would like to become a marketer of the software when it launches its service later this year.

For now, however, IBM's marketing of PC Videotex seems to be aiming at a business, not a consumer audience—even though Seelinger says both markets are important. The product will be sold through IBM's National Account Division and National Marketing Division sales forces as well as through IBM Product Centers. It complements IBM's Series 1/Videotex System, based on the Series 1 minicomputer, which allows companies to create in-house videotex systems for employee and customer information. Although IBM itself, Buick, Equitable, and other companies have inhouse videotex systems, their overall numbers are small. Link Resources, New York, has surveyed 50 corporate MIS directors in the past year and found a lack of interest in videotex; it estimates only 25 private systems have been installed.

Another IBM videotex venture is aiming squarely at the consumer market, however. This is the joint venture with CBS and Sears that was announced in February, and which has since been named Trintrex. The Trintrex mission is specifically to offer a videotex service through home and personal computers, including any with a substantial installed base: the Apple II family, the Commodore 64, and of course the IBM PC are obvious choices, although Trintrex says it's too early for specifics. It will spend the next two years working out technical and service details before launching a business.

Aside from the enormous financial resources that the three partners bring to Trintrex, and the preeminent position that the microcomputer will occupy as a delivery medium, a few other differences are apparent between it and the Knight-Ridder and Times Mirror approaches. For one thing, Trintrex will be a national service from the outset, unlike the newspaper-sponsored offerings, which are confined to a single region. (Both Knight-Ridder and Times Mirror have agreements with other newspapers to offer licensed versions of their services, depending, of course, on consumer acceptance in the initial markets.)

For another, the Trintrex plan—always subject to revision—gives the most prominent place to at-home shopping as the motivating force for consumers, and to national advertising as the economic underpinning. This is understandable in view of Sears' position as the largest direct marketer (through its catalog sales) and the role of the CBS Television Network as the nation's largest single national advertising medium. Electronic shopping, nonetheless, has not been notably successful in any one of a number of two-way cable tv trials. Comp-U-Card—the one company engaged in it on a national scale—derives most of its revenues from membership fees rather than from the actual sale of goods and services.

The third difference, which is a corollary of the second, is that Trintrex expects most of its revenues to come from advertising and transaction fees, rather than from subscriber payments. Not that Knight-Ridder and Times Mirror downplay advertiser support; in Viewdata's projections it represents anywhere from 40% to 70% of revenues; in Times Mirror's, from 60% to 70%. Trintrex, however, is obviously aiming even higher.

Finally, the new venture will not suffer from undercapitalization. Whereas the $17 million budgeted for Viewtron this year is equivalent to nearly 5% of Knight-Ridder's after-tax cash flow from operations, combined cash flow for CBS, IBM, and Sears last year exceeded $15 billion (of which IBM accounted for 76%). The companies refuse to give details about their investments, but it would be surprising if each weren't committed to at least $50 million initially. Fig. 4 compares what is known of Trintrex to two other videotex ventures.

(It bears repeating that big investments can mean big losses as well as big payoffs. CBS dropped more than $40 million on CBS Cable. IBM's investment in Satellite Business Systems, still deeply in the red, runs into the hundreds of millions; its loss on DiscoVision Associates, never publicly disclosed, was tens of millions of dollars.)

SOME VIDEOTEX PROPHETS

Those who believe strongly in videotex often voice their faith in the language of social prophecy, not of business. IBM's Seelinger downplays the early, slow reception of Viewtron in Florida. Videotex, he says, represents "a major behavioral and cultural change in our society" and notes that "we don't adapt to changes like this so readily." After all, the telephone and automobile took decades to penetrate 50% of American households.

Albert Gillen, president of Knight-Ridder Broadcasting and of Viewdata, speaks in similar sweeping terms: "Videotex is going to have a profound effect on our social and behavioral patterns. It will change the way we buy and sell products and services in America. It will enable families to rearrange the time demands of their life-styles." At AT&T, Farmer says, "No, we're not discouraged. We know this thing requires changes in habits." The experience thus far only demonstrates the "need for staying power" on the part of industry suppliers.

This long view on the part of business is admirable, but seems incongruous. We usually look to poets, social thinkers, or visionaries to tell us what society will be like in the future. From companies we expect something more concrete. When AT&T, IBM, Knight-Ridder, and Times Mirror all talk about how wonderful a given technology will be in the future, they leave themselves open to the suspicion that they haven't got a product that anybody wants today.

In truth, the picture is more ambiguous than this. The evidence is that hundreds of thousand of business customers want, and are willing to pay for, databases that deliver market prices, stock quotes, financial reports, technical and scientific citations, and a host of other specialized data. The evidence is also that a minority—perhaps a significant minority—of people doing work or managing investments at home are willing to do the same. Moreover, there is every reason to think that when the right mix of banking services is offered at the right price, millions of people will forsake written checks for electronic payments—though this does not solve the problem of making deposits and getting cash.

To generalize from this state of affairs to a mass consumer market for computerized information and transactions in the specific videotex format, with NAPLPS color and graphics, is to make a leap of faith as yet unwarranted by facts. The videotex visionaries undoubtedly have their sources of inspiration for such leaps.

The rest of us will have to wait for more earthly persuasions. ◉

Efrem Sigel is the author of two books about videotex entitled *Videotext: The Coming Revolution in Home/Office Information Retrieval* (1980, Knowledge Industry Publications) and *The Future of Videotext* (1983, Knowledge Industry Publications). He is president of Communications Trends Inc., Larchmont, N.Y., which does publishing, research, and consulting about computer services, software, and electronic information services.